Non-Market Valuation for Environmental and Health Policy in Mexico

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Declaration

I certify that the thesis I have presented for examination for the PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it).

I warrant that this authorisation does not, to the best of my belief, infringe the rights of any third party.

I declare that my thesis consists of 47,994 words.

Abstract

This thesis contains five studies that make use of non-market valuation techniques and of data collected in Mexico to make methodological and policy contributions to the field. In the order that they are presented in the thesis these are:

- a contingent valuation study, based on data collected face-to-face of a representative sample of the population of Mexico City, to calculate a value of statistical life for Mexico and make an assessment of whether the benefit-transfer values that have been and continue to be used in the country are appropriate for policy-making;
- a study that uses data collected online on whether the type of organisation sponsoring a contingent valuation survey affects the amount participants say they are willing to pay for the good being valued (in this case mortality risk reductions), all else equal;
- a study that uses the same dataset to consider the relationship between trust in institutions and other forms of social capital and contingent valuation results;
- an hedonic pricing analysis that makes use of several datasets (including high-resolution property data that is not in the public domain) and seeks to improve on previous attempts at applying this method in a developing country context (jointly using spatial econometrics and an instrumental variables approach); and
- a short study on whether there is a relationship between air quality, social capital and subjective wellbeing in Mexico City.

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Abbreviations

AGEB – Basic Geostatistical Area (Área Geoestadística Básica)

AQ – air quality

BT – benefit transfer

CBA – cost-benefit analysis

GPS – generalised propensity score

IDB – international development bank

IMECA – Metropolitan Air Quality Index (Indice Metropolitano de la Calidad del Aire)

INECC - National Ecology and Climate Change Institute (Instituto Nacional de Ecología y Cambio Climático)

IDW – inverse distance weighting

IV – instrumental variable

ENIGH - Mexican Household Income and Expenditure Survey (Encuesta Nacional de Ingresos y Gastos de los Hogares)

MVMA – Mexico Valley Metropolitan Area

O3 – ground level ozone (measured in ppb)

PCA – principal component analysis

PM10 – particulate matter less than 10 micrometres in size (measured in µg/m3)

PM2.5 – particulate matter less than 2.5 micrometres in size (measured in µg/m3)

ppb – parts per billion

PSM – propensity score matching

RAMA- Automatic Atmospheric Monitoring Network (Red Automática de Monitoreo Atmosférico)

SWB – subjective wellbeing

VSL – value of statistical life

WHO – World Health Organisation

WTP – willingness to pay

µg/m3 - micrograms per cubic metre

Chapter 1
Introduction

In 1992 a United Nations Environment Programme/World Health Organisation (UNEP/WHO) report described Mexico City as the most polluted city in the World (UNEP & WHO, 1992). Since then air pollution in the city has been significantly reduced, with much of the change attributable to regulatory measures applied in the mid-1990s to cars (fuel quality regulations, limitations on circulation) and industry (plant closures, industrial point-source emissions regulations). Much of that legislation is now nearly 20 years old. However, the three pollutants considered in this study (PM10, PM2.5, and O3) still frequently fail to meet Mexican air quality standards, despite progress, as well as the generally more stringent WHO guidelines.

In line with developments worldwide an increasing emphasis is being given by the Mexican Government to the use of cost-benefit analysis (CBA) to inform environmental policy decisions. A crucial component of environmental CBA is the valuation of benefits accruing from potential environmental improvements. The Mexican Government currently makes use of benefit transfer (BT) techniques to place a monetary value on environmental improvements within Mexico due to a lack of studies measuring directly the preferences of the Mexican population for those environmental improvements. In the case of air pollution these BTs have been made based on figures from the U.S.A. For the value of mortality risk reductions these have most commonly been based on Kochi et al. (2006), which suggests a value of USD 5.4 million (2000 USD) for the U.S.A. This value has been adjusted by BT to USD 1.65 million for Mexico (2010 USD; SEMARNAT & INECC, 2014).

BTs have, however, on instances been found to produce large disparities between the transferred value and an equivalent directly measured value (Pearce et al., 2002). In part these disparities can often been attributed to the assumptions required for the BT. Even in the simplest BT, one based only on income adjustment, a large range of outcome values can result from assumptions made on the elasticity of income (i.e., even if one discounts the implications of choosing from a wide menu of potential source values). Other differences between source values for the BT and 'true' values, as measured directly though primary data collection, can be attributable to socio-economic or cultural differences that may distinguish preferences between source country and target country, or to different types of relationship with the underlying good being valued (for example, for air pollution, background levels of pollution may contribute to different levels of habituation, and typical length and frequency of exposure may vary between a richer and a poorer country, all of which could affect preferences).

There is one peer-reviewed study deriving a value of statistical life (VSL) for Mexico, based on the wage-risk method, by Hammitt & Ibarrarán (2006). The authors use data from both in-person interviews and official sources on the perceived and actual risk of death from accidents at work. They find that worker-perceived and recorded (actual) mortality risks are consistent. Trade-offs between risk and income result in VSL estimates between USD 235,000 and USD 325,000. The large difference between the Hammitt and Ibarraran (2006) Mexico wage-risk figures and the BT values based on the Kochi et al. (2006) meta-analysis figures for the U.S.A. currently being used highlights the need to understand well the process and merits of BT: a BT applying income adjustment only (including income elasticities) to US figures would generally lead to a much higher estimate of Mexican VSL being generated than what is suggested by the available evidence in the Hammitt and Ibarraran study, but perhaps only because the source values are 'high' themselves (i.e., even in the context of values in the source country). There are differences between the US and other countries in preferred methodological approach when setting 'administratively approved' VSL figures[1].

The OECD (Biausque et al., 2012) notes that there is a 'reliance on revealed preference methods in terms of wage risk studies in the United States (where most such studies have been conducted), while Europe, Canada and Australia rely more on stated preference methods, eliciting people's willingness-to-pay (WTP) for changes in mortality risks'. There are typically significant differences between revealed preferences and stated preferences VSLs, with the former generally producing higher money value estimates (i.e., U.S.A. administrations tend to use a higher VSL values than other administrations due to the sourcing of VSL from revealed preference methods). For the purposes of environmental policy there is a general trend though away from wage-risk studies and into contingent valuation as well as, more recently, experimental methods. This is due to primarily to: 1) differences in the nature of the underlying risk being measured between wage risk and environmental risk studies: wage risk is associated with accidental/traumatic death – with no latency or a negligible latency period -, whereas environmental risk tends to be associated with chronic exposure, and with death occurring after a period of illness; 2) differences in the relevant populations and in their associated preferences (wage risk studies focus on working age populations in risky jobs, whereas environmental risks often affect the population at large or even primarily children or the elderly); and 3) potential effect in exposure to occupational risk being generally

[1] 'Administratively approved' VSLs are VSLs that have been officially adopted by different public entities for the purpose of cost-benefit analysis.

voluntary, whereas environmental risks are less so (Krupnick, 2007; Cropper et al., 2011; Biausque et al., 2012).

Table 1 summarises various administratively approved VSLs from around the World, updates them to a single base year, and applies income adjustment at different income elasticities to provide a range of BT figures for Mexico. As can be seen from table 1 the elasticity used in the BT has a large effect on the final Mexican VSL. As such it is important to have guidance on the most appropriate elasticity or range of elasticities as these may be used for the purpose of sensitivity analysis in CBAs. A commonly cited range for income elasticity of the VSL comes from Viscusi & Aldy (2003), which find income elasticity to be between 0.5 and 0.6. However, in Viscusi (2009) the 0.5 to 0.6 range is deemed to be suitable for the populations of the specific wage risk studies underlying the related VSL estimates, but not for the population at large, which is likely to be more risk averse. For the population at large Viscusi (2009) finds the elasticity is more likely to be 1. The OECD (2012)suggests using an elasticity of 0.8.

However, Hammitt & Robinson (2011) argue that while a value of 1 may be correct for high income populations, it is likely that for low income populations the income elasticity of VSL is greater than 1, which intuitively indicates that, proportionately, reducing exposure to risk of death is valued more highly as income increases at the earlier stages of economic development (avoidance of risk is a 'luxury' good at this stage). Hammitt & Robinson (2011) call for sensitivity analysis to be conducted on the benefit-transferred VSL, including on the effect of varying the elasticity used, as well as for more research to be done on population risk preferences in low income populations.

This thesis took as a starting point this empirical knowledge gap in Mexico: a lack of primary data-sourced research that could be used by environmental and health policymakers to inform their resource allocation decisions on the basis of cost-benefit analyses. To fill this gap a collaboration with Mexico's National Ecology and Climate Change Institute (INECC, the Mexican Environmental Agency) was organised whereby the Institute would collect data on a previously agreed questionnaire and offer their expert advice on the policy context for the research, while I offered data analysis and a report on my findings that included a calculation of the value for statistical life in Mexico (which was delivered to the Mexican authorities in May 2015[2]). This analysis of the value of

[2] In terms of the policy impact of the research beyond Mexican government institutions, economists at the Centro Mario Molina, a leading Mexican research and advocacy organisation on issues of energy, climate change and air pollution, have also expressed an interest in using the results of the research in their applied work.

Table 1 – Benefit transfer for Mexico from a range of administratively approved values and from Kochi (2006) – with 0.5-2 elasticity sensitivity

					USD 2010 - income adjusted elasticities			
Country	**Organisation**	**Value**	**Year**	**Methodology (meta-analysis)**	**0.5**	**1**	**1.5**	**2**
United States	EPA	USD 7.5 million	2007	wage-risk, some stated preference	3,588,877	1,623,493	734,416	332,226
United States	Dept of Transportation	USD 5.8 million	2007	wage-risk	2,775,398	1,255,501	567,948	256,922
United States	FDA	USD 5 million	2007?	wage-risk	2,392,585	1,082,329	489,611	221,484
United States	Dept of Homeland Security	USD 6.3 million	2007	wage-risk	3,014,657	1,363,734	616,909	279,070
United States	[Kochi, 2006]	USD 5.4 million	2000	wage-risk and stated preference	2,626,572	1,069,505	435,488	177,325
Canada		CAD 7 million	2007	wage-risk	2,831,007	1,325,769	620,862	290,751
Canada		CAD 5 million	2007	stated preference	2,022,148	946,978	443,473	207,680
United Kingdom	Dept for Transport	GBP 1 080 760	2007	stated preference	814,113	368,353	166,665	75,409
European Union	European Commission	EUR 1 million	2000	stated preference	820,883	472,691	272,191	156,737
Australia		AUD 3.5 million	2007?	stated preference	1,254,591	607,430	294,096	142,391
OECD	OECD	USD 3 million	2005	stated preference	1,730,806	892,664	460,391	237,447
Mexico	[Hammitt&Ibarraran, 2006]	USD 235 thousand	2002	primary wage-risk (not meta-analysis)	271,070			
Mexico	[Hammitt&Ibarraran, 2006]	USD 325 thousand	2002	primary wage-risk (not meta-analysis)	374,883			

Note: The source for all the administratively approved VSL figures is OECD (2012). In the cases of Canada and Australia no organisation was identified as responsible for the figures.

statistical life in Mexico constitutes, in the main, chapter 2 of this thesis (‘The value of a statistical life in Mexico’)[3].

In addition, and as part of our collaboration, INECC was also instrumental in procuring a rich survey dataset from Mexico’s National Statistics Office (INEGI) that is not available in the public domain at a high level of geographical detail[4] for an hedonic pricing analysis. This dataset was combined with publicly available data on the yearly distribution of air pollution and other physical and locational data to produce chapter 5 (‘Hedonic pricing of air pollution in the Mexico Valley Metropolitan Area’).

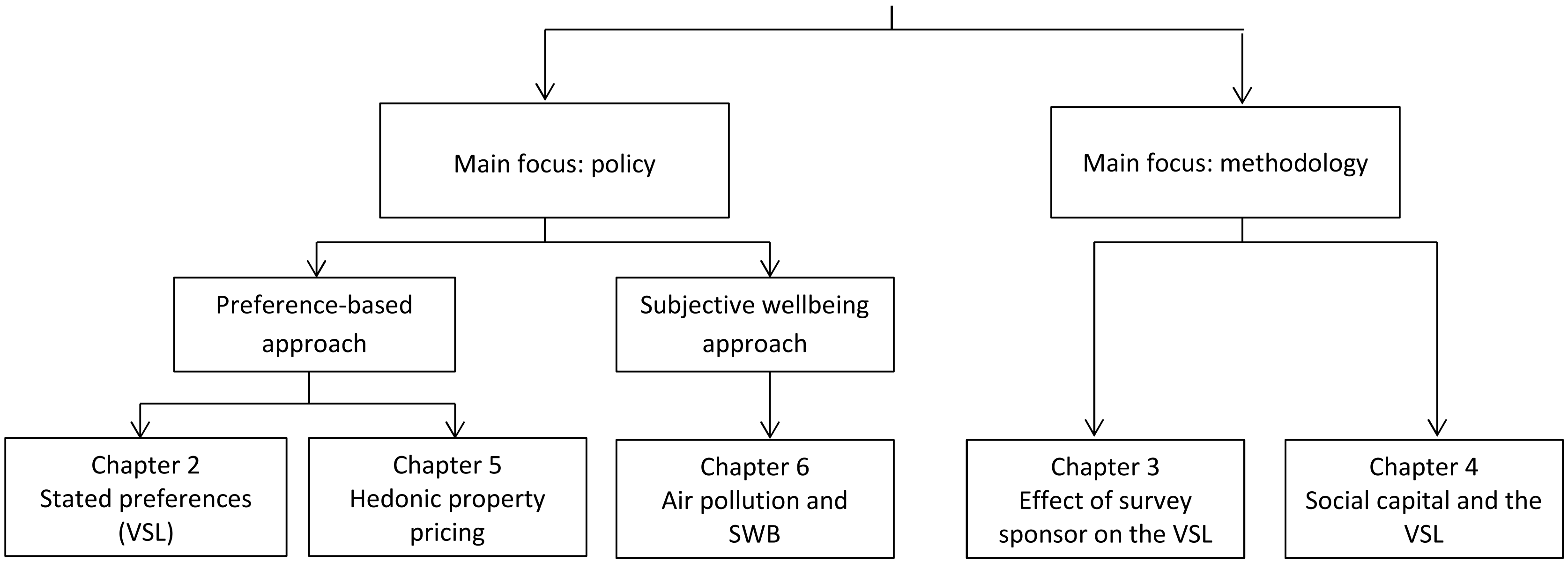
Both chapter 2 and chapter 5 fall within the individual preference-based approach to the measurement of utility, and their results are directly applicable to policy analysis using CBA. Chapter 2 results in a stated-preference VSL figure that can be directly multiplied by the number of fatalities prevented by a policy, appropriately discounted, to produce a measure of the benefits of that policy (in what relates to avoidance of premature mortality, often the dominant share of air pollution reduction policies). This VSL figure was found to be of USD 210,880 (MXN 1,687,037). Further research results from chapter 2 include that there was no support for a senior discount rate, that health expenditures are household-level decisions rather than individual decisions, and that the data results in a negative discount rate, meaning that individuals are willing to pay more to reduce future risks of dying than to reduce equivalent present-day risks, possibly due to concern with end of life quality.

Chapter 5 produces a different measure of benefits, using data from an existing market (property rentals) to derive a value for air pollution, for which a market is lacking. The results are that PM2.5 and PM10 pollution are found to have a significant effect on rental property prices, whereas O3 does not. It is possible that the results for O3 are due to imperfect information by renters. A conservative estimate of the willingness to pay for marginal reductions in PM2.5 was calculated at USD 122.72, while PM10 was calculated at USD 24.53. The analysis shows that air pollution can be a significant factor in determining the value of housing property in Mexico. The stated-preference VSL and the hedonic pricing values may overlap in meaning to an extent, as some of the value of reducing air pollution at the location of residence will pertain to avoiding exposure to own-mortality-inducing pollutants (but may also include other non-own-mortality effects of air pollution at the location).

[3] Figure 1 shows the structure of the thesis.

[4] From the Mexican Household Income and Expenditure Survey (ENIGH). The dataset includes, among others, information on housing characteristics and rental values for the respondents.

Figure 1 – Structure of the thesis



That is, the VSL and the hedonic pricing values are not additive, but rather alternatives to each other when monetising the benefits of a policy.

The geographical scope of chapters 2 and 5 (as well as chapter 6, described below) is the Metropolitan Area of the Valley of Mexico (MAVM), which is comprised of all of the Mexico City Federal District ('Distrito Federal', which in turn has 16 Delegaciones), 59 municipalities (or Municipios) in the State of Mexico and 1 municipality in the State of Hidalgo[5]. The remaining chapters used data collected from several urban locations, including the MAVM, in Mexico. The MAVM is located in a valley surrounded by mountains on three sides (East, South, West), which has the effect of trapping air pollution in the area, and is at high altitude, which contributes to inefficient combustion processes (more pollution is emitted per unit of energy produced than at lower altitudes).

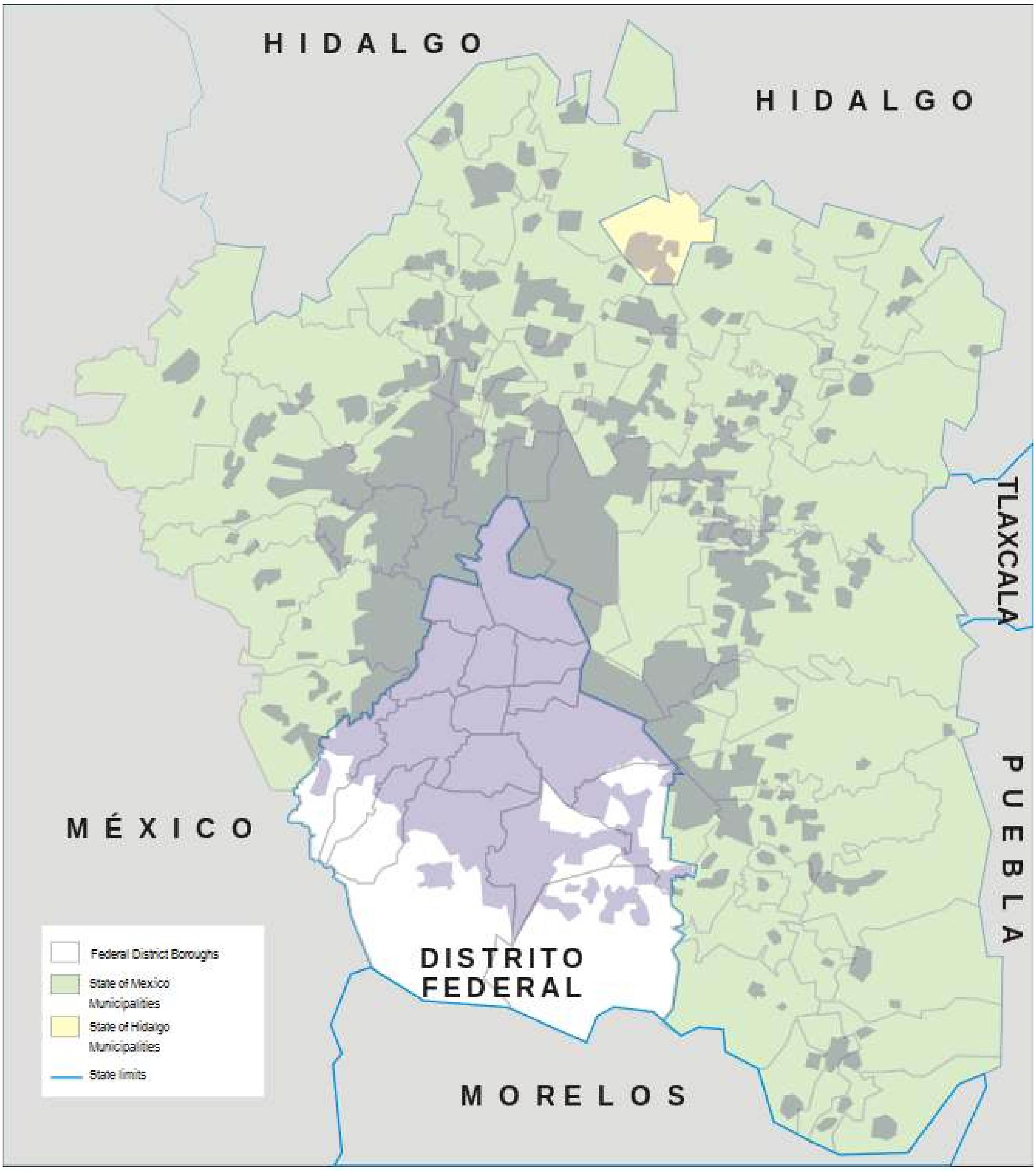
The geographical area can be further divided into Basic Geostatistical Areas (AGEBs), which in size and delineation are similar to urban block groupings (in U.S.A. census data). This is the geographical area used for the hedonic pricing analysis in chapter 5 and for the subjective wellbeing approach in chapter 6 (or, more precisely, the centroids of each AGEB are used). Each AGEB contains 1 to 50 housing blocks and averages about 1,500 individuals (national average). The delineation of AGEBs does not cover all of the Mexican territory, just the populated areas. The populations within each AGEB tend to be statistically very similar on socio-economic indicators[6]. The MVMA AGEBs are shaded in Figure 2.

Chapters 2 and 5 are in a sense the basis for the other chapters. Chapter 3 and chapter 4 are interested in the methodological validity of the stated preferences method used in chapter 2. Chapter 3 ('Survey sponsor effects on the willingness to pay for mortality risk reductions') uses the analytical framework of chapter 2 to run an experiment on whether the type of entity sponsoring the stated preference survey affects the resulting VSL that can be calculated from the data, all else equal. This may have implications for policy, as if the entity sponsoring the survey has an effect on the results of that same survey, then the validity of the monetised values that are obtained from the procedure as 'real' expressions of social preferences is questionable. What do these values represent: the expression of preferences for the good, attempts at influencing the outcomes of the study, or the respondent's attitudes towards the surveyor? The most significant result was found for the WTP values for the two options that tested for an effect of a government ministry sponsorship

[5] In what follows the Delegaciones and Municipios of MVMA are referred to as boroughs.

[6] According to expert advice from economists in the Mexican Government.

Figure 1 – Metropolitan Area of the Valley of Mexico – boroughs (Delegaciones and Municipios)



Source: adapted public domain image

(namely for an Environment Ministry sponsorship and for a Health Ministry sponsorship, with a stronger effect in the former case). The sponsorship effect was to reduce average WTP by between 22% and 25% in the case of the Environment Ministry, and by 13% and 17% in the case of the Health Ministry[7] (when compared to the average WTP of the other survey sponsor types).

Chapter 4 ('Social capital and willingness-to-pay: The association between trust in institutions and the value of a statistical life') also considers the relationship between survey respondents and their cognitive context, but here in terms of the relationship that may exist between social capital measured at the level of the individual and their expression of stated preferences. In particular, chapter 4 is interested in whether the level of trust different types of individuals have in their institutions is related to their expression of preferences for healthcare (in this case for the willingness to pay for a product that reduces mortality risks), controlling for other factors. If trust in institutions is associated to demand for healthcare, it is possible that stated preferences are in part endogenously determined by institutions, if one accepts that those institutions are agents in determining their own trustworthiness with the public. The trust in institutions regression results show a fragmented picture of the relationship between social capital and WTP for mortality risk reductions. There is some evidence of a relationship for some types of social capital, especially when the sample is divided by type of economic or social capital group, where some more consistent results appear between the different WTP questions.

Chapter 6 ('Air pollution and subjective wellbeing in Mexico City') presents a short empirical study that extends the environmental valuation framework presented in the previous chapters to non-monetary measures of utility. This chapter is based on recent research that has often found a relationship between subjective wellbeing and air pollution in several developed countries (only one example of such research was found in a developing country context). Subjective wellbeing measures are non-monetary measures of utility, based on qualitative assessments by individuals of their own psychological state, along various dimensions. These measures have recently been used in CBAs in some developed countries as an alternative and a complement to more established monetary measures of utility, such as the ones described in the other chapters (stated and revealed preference approaches). The analysis assesses whether a relationship between air pollution and subjective wellbeing exists in the context of Mexico City. In addition, the chapter considers in more detail this relationship for different social groups, by disaggregating the data by income level (top and bottom 20% income) and by assigning individuals to one of four types of social capital groups

[7] Figures for the sample C comparisons of regression estimates. A table with the effects on average WTP of the Environment Ministry and Health Ministry sponsorship can be found in Annex 3.2.

(sorted by what type of engagement they have with civic society organisations and by their level of trust in others). The chapter seeks to contribute to the debate on whether people in developing countries value environmental conditions. The disaggregation of the data is aimed at considering how the relationship between air pollution and subjective wellbeing varies for different groups within Mexico City, which may have implications for the development of public policy (for example in equity terms).The results of the analysis show mixed evidence of an impact of air pollution concentrations on SWB in the MVMA for three pollutants considered (PM10, PM2.5, O3). Recommendations are made for future research.

Overall this thesis aims to make a contribution to the validation and understanding of the measures that economists use in CBAs of the health and other benefits associated with environmental improvement policies (with a particular focus on air pollution), as well as to investigate policy-relevant questions on the valuation of these benefits in the context of Mexico (while drawing broader policy lessons where possible). In terms of validation, the thesis finds that values obtained by the stated preferences method can be affected by who is sponsoring the elicitation survey. In terms of understanding it was found that measures of social capital, including some measures of trust in institutions, correlate significantly with stated preference willingness-to-pay for mortality risk reductions. This raises a question of endogeneity in individual healthcare preferences, whereby preferences stated by individuals may not be a given but instead be subject to societal choices about investment in the formation of social capital. The thesis also finds that measures of utility that are, for different reasons, little applied in less developed countries can be usefully employed to provide a richer understanding of what drives individuals' utility in what relates to environmental goods in those countries.

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Chapter 2

The value of a statistical life in Mexico

Most air pollution legislation in Mexico was first introduced in the early to mid-1990s. Although significant progress has been made since then in improving air quality in the Mexico Valley Metropolitan Area (MVMA[8]), registered levels of air pollution at monitoring stations are still frequently significantly high and in breach of the Mexican and international standards considered acceptable for human health (INE-Semarnat, 2011). A significant amount of legislation relating to air pollution and air quality has not been updated since that first raft of legislation was introduced: there is currently scope for reviews and updates to the legislation to be made and there are a few recent and ongoing initiatives in this sense.

Building on practices that are already established in the USA and other OECD countries, as well as in the EU, Mexico has been making an increased use of cost-benefit analysis (CBA) to inform decisions on environmental policy. However, there is limited direct information on the economic preferences of the Mexican population for changes to environmental conditions that affect their health. Mexican regulators have thus had to rely on benefit-transfer (BT) techniques to assign a monetary value to the benefits resulting from reduced air pollution that would result from the introduction of new policies (mostly to value mortality effects rather than morbidity effects, as the former can be expected to represent the most significant share of benefits). However, benefit-transfer techniques can be highly sensitive to the assumptions made in the transfer (for example, what income elasticity measure to adopt to take into account differences in income levels between source and target country – see introduction).

To address this knowledge gap this chapter uses primary data[9] collected in the MVMA to produce a value of statistical life (VSL) for Mexico that can be used in the monetisation of reduced mortality resulting from air pollution mitigation policies (while noting that the way the VSL is derived here

[8] The MVMA includes the Federal District of Mexico City and part of the surrounding States.

[9] Data collection for this chapter was funded and implemented by Mexico's Instituto Nacional de Ecología y Cambio Climático (INECC).

means it is not policy context-dependent and thus can also be used for the monetisation of reduced mortality in other policy areas)[10]. The analysis produces a VSL for Mexico of USD 210,880 (MXN 1,687,037; 2010 values). This value is low compared to the current benefit-transfer values being used by the Mexican government, but in line with the results found for the U.S.A. and Canada in studies employing the same survey methodology used here (taking as a measure the share of after-tax income of willingness to pay for a 5 in 10,000 mortality risk reduction).

The survey instrument used in this chapter is a questionnaire adapted from the work by Alberini, Boyle, & Welsh (2003) and Krupnick, Alberini, & Cropper (2002). These papers have formed the basis of a suite of studies on VSL that have been conducted in several countries around the World. These studies are of interest to Mexican policy makers as they allow, to an extent, to contextualise the use of benefit-transfer to assign a VSL to the Mexican population. By comparing the results of hypothetical benefit-transfers from U.S.A. values to these other countries and to Mexico with the results derived from primary data collected through a standardised questionnaire applied in each of those countries some idea of the validity of the currently applied method of BT can be formed. The countries where the survey instrument has been applied are: Canada and the U.S.A. (Alberini et al., 2003; Alberini, Cropper, Krupnick, & Simon, 2004; Krupnick et al., 2002), Japan (Itaoka, Krupnick, & Akai, 2007; Krupnick, Alberini, Simon, & Itaoka, 2005), the United Kingdom, France, and Italy (Alberini, Hunt, & Markandya, 2006), Brazil (Ortiz, Markandya, & Hunt, 2009), Mongolia (Hoffmann et al., 2012), and China (Krupnick, Hoffmann, & Qin, 2010).

1. Background

Methods for the valuation of non-market goods, such as mortality risk reductions that result from public policy interventions, can be broadly divided into revealed and stated preference methods. Revealed preference methods use data from a related market to derive a value for the non-market good (e.g. the housing market to see how house prices are affected by air pollution, thus determining a partial economic value for air pollution). In the case of mortality risk reductions the most common revealed preference method used in the literature is the wage-risk method, the relationship between the wages received for an occupation and the mortality risk associated with that occupation. However, the use of values derived from the wage-risk studies might not be appropriate for use in air pollution policy CBAs as: 1) wage-risk studies measure risks in a working-

[10] The application of the VSL to air pollution can, for example, be extended to climate change policy: most of the benefits stemming from climate change policy in the short-term result from ancillary reductions to air pollution (from reduced human mortality rates).

age population, whereas most of the mortality caused by air pollution increases mortality rates among the elderly and children; 2) they measure the risk of sudden death, whereas mortality due to exposure to air pollution tends to have relatively long latency periods before death; and 3) they measure death caused by accident, whereas air pollution primarily causes death due to illnesses, such as bronchitis or cancer. Thus it is questionable whether the risk in wage-risk studies and the risk from exposure to air pollution are commensurable and whether it is appropriate to use wage-risk VSLs in air pollution policy decisions.

Stated preference studies offer an alternative way of calculating a VSL that avoids the issues with wage-risk studies. Stated preference studies can ask people directly to value their mortality risk and, through appropriate survey designs, produce reliable measures of the VSL for use in air pollution policies and policies with related risk profiles. In practice, both values are used in CBAs, but there is a growing view that they should be considered separately in that analysis (e.g. U.S. Environmental Protection Agency, 2010) and that, for the reasons listed above, VSLs based on stated preference studies are more appropriate.

There is one peer-reviewed study deriving a VSL for Mexico, based on the wage-risk method, by Hammitt & Ibarrarán (2006). The authors use data from both in-person interviews and official data on the perceived and actual risk of death from accidents at work. They find that worker-perceived and actual mortality risks are consistent. Trade-offs between risk and income result in VSL estimates between USD 235,000 and USD 325,000.

2. Theoretical model

The analysis is based on a life-cycle consumption model with an uncertain lifetime (Alberini et al., 2004; Cropper & G. Sussman, 1990). In the model an individual's present-value WTP to consume a product that reduces the risk of death now and in the future is described by the following utility function:

$$V_j = \sum_{t=j}^{T} p_{j,t} \cdot (1 + \delta)^{j-t} \cdot U_t(c_t) \qquad (1)$$

Where V_j is the expected present value of consumption over an individual's lifetime, j is current age, $p_{j,t}$ is the probability that the individual survives to age t, δ is the individual's subjective rate of time preference, U_t is the utility of consumption at age t, c_t is consumption at age t, and T is the oldest age to which the individual can survive.

The individual maximises V_j by choosing a consumption pattern over her lifetime, subject to her initial wealth, yearly income, and alternatives for expenditure (opportunities for investment). The budget constraint is:

$$\sum_{t=j}^{T} p_{j,t} \, . \, (1+r)^{j-t} \, . \, c_t = \sum_{t=j}^{T} p_{j,t} \, . \, (1+r)^{j-t} \, . \, y_t + W_j \tag{2}$$

Where r is the risk-free interest rate, y_t is earnings in year t, and W_j is initial wealth.

The greatest present value of the utility of lifetime consumption is achieved by maximising (1) subject to (2).

Supposing that an exogenous reduction in the future risk of dying is offered, D_k, then the WTP for that risk reduction is equal to:

$$WTP_{j,k} = \frac{dV_j/dD_k}{dV_j/dW_j} \, . dD_k \tag{3}$$

Maximum WTP is equal to the reduction in the individual's wealth that leaves her indifferent between benefiting or not from the risk reduction.

3. Structure and implementation of the survey

The stated preference survey asks respondents for their willingness to pay (WTP) for a set of different products that reduce their personal risk of dying. The products are not defined, besides stating that they are for own use and that they reduce the risk of death. This is to avoid biasing responses on the basis of context. For example, if the product was linked to the effects of air pollution this might raise questions of responsibility to pay for the health damage by the polluter. Or context may suggest that the product might cause side effects, have varying effectiveness, or have benefits to others that go beyond the individual's private WTP for her own reduced risk of dying.

Two contemporaneous amounts (5 and 10 in 10,000) and one future amount (5 in 10,000) of risk reduction are offered to respondents through these products[11]. These risk reductions are broadly in

[11] A 1 in 10,000 mortality risk reduction option was also considered but rejected as in previous applications of the survey (in other countries) this size of risk was found to generate a very large number of zero WTP answers (being perceived as too small to be distinguishable from the *status quo*), and to be difficult to understand in focus groups. In focus group tests for Mexico it was found that opinions were roughly equally divided on whether a 1 in 10,000 mortality risk reduction was 'too small to matter'.

line with the typical values resulting from public policy interventions to reduce mortality risks (such as air pollution reduction policies). The study uses a split sample with the 5 and 10 in 10,000 WTP questions shown in alternate order randomly to participants, who are thus assigned to one of two separate groups or 'waves'. The associated payments needed for these products (risk reductions) would be made once a year over a period of ten years starting in the current period[12].

The survey elicits the WTP associated with these risk reduction values through the payment card approach, where respondents were presented with a list of several monetary values in Mexican Pesos (MXN) from which they can choose the value that is closest to their maximum WTP. The questionnaire is computer-based, which allowed displaying information to respondents that is specific to their age and gender (information on baseline risks of death per age and gender group, on leading causes of death for their age and gender, and on medical and non-medical measures to mitigate those risks of death, including an indication of the financial cost of those measures). Although the survey was originally developed for application in Canada and the USA, it has since then been applied successfully in several countries, with varying incomes, local cultures and other social and economic characteristics.

3.1. Regional and demographic focus

The questionnaire is applied to citizens of the Mexico Valley Metropolitan Area (MVMA) aged 40 to 75. The MVMA is the largest metropolitan area in the country, with about 20 million inhabitants, or 17% of the total Mexican population. Epidemiological studies show that the likelihood of dying due to air pollution increases with age (Samet & Zeger, 2000), and the contingent valuation studies that have used the same questionnaire have shown respondent insensitivity on willingness to pay to mitigate own risk of dying by the younger adult populations (under 40 years old). As such the age group focus that was taken in the other studies (on people aged 40 to 75) was maintained.

3.2. Structure of the questionnaire

The questions are presented to respondents following the structure:

1. Questions about age, gender, family and own health history (allowing classification of respondents by age and gender, and collecting relevant health data for statistical analysis);

[12] In the following, total WTP is reported rather than annual WTP for the risk reductions

2. Explanation of the concept of probability (to increase understanding of the product description that is to follow, using practical examples, namely a coin toss and a dice throw, then extended to the 1,000 square grid representation of probabilities used in the survey);
3. Test of understanding of probability (to assess respondents' ability to make an informed judgement about the products being offered);
4. Display of age and gender-specific leading causes of death and medical and non-medical death risk mitigation strategies and their approximate associated costs (to highlight to respondents what their baseline risks of dying are and that they can make active choices to mitigate these risks, at a cost);
5. The mortality risk reduction products are offered and the WTP question for each of these products is asked (including a measure of confidence in the WTP replies, on a 1 to 7 scale from not confident at all to very confident). The respondents are here randomly assigned to one of the two waves, where the two risk reduction levels for a contemporaneous reduction in risk (5 in 10,000 over 10 years, or 10 in 10,000) are shown alternatively as the first WTP question to be answered (followed by the other contemporaneous risk reduction – see table 2). The split sample design allows running external scope and ordering effects tests on the data;
6. Finally, questions on comprehension of the survey (understanding of the concept of probability, acceptance of the risk scenario, etc.), and socio-economic data are collected (level of education, income, marital status, etc.); and the respondents are given the chance to change their previously stated WTPs.

The full text of the questionnaire can be found in Annex 2.1, and several screenshots from the questionnaire are shown in Annex 2.2 for illustration.

Table 2 – Structure of the questionnaire – split sample, two waves

	First contemporaneous risk reduction question	**Second contemporaneous risk reduction question**	**Future risk reduction question (aged 40-60 only)**
Wave 1	5 in 10,000	10 in 10,000	5 in 10,000
Wave 2	10 in 10,000	5 in 10,000	5 in 10,000

3.3. Payment card

The payment card approach, first developed by Mitchell & Carson (1981, 1984), is one of the main WTP elicitation formats in the stated preferences literature. Payment cards were aimed at addressing starting point bias problems that are observed with the dichotomous choice elicitation format: the initial amounts presented to respondents often have an effect on whether the respondent says 'yes' or 'no' to subsequent amounts presented under dichotomous choice (K. J. Boyle, Bishop, & Welsh, 1985; Chien, Huang, & Shaw, 2005; Rowe, D'Arge, & Brookshire, 1980) [13]. In the payment card approach the respondents are shown a range of alternative payment values to choose from, from a very low amount (typically zero) to a high amount (under best-practice conditions high enough to not truncate values for respondents with high WTP, but not so high that the value is not credible), rather than asked to respond to an increasing or decreasing sequential set of values, as in the dichotomous choice case, and thus have no single value on which to anchor their valuation of the good being offered (Green, Jacowitz, Kahneman, & McFadden, 1998). Payment cards are also more statistically efficient than dichotomous choice formats as more information on the bounds of WTP is collected from a single answer under the former than the latter, which reduces the variance in the data (Boyle, 2003).

Subsequent literature on payment cards formats focused on concerns that the elicited WTP values may be sensitive to design aspects of the payment card, such as the range of values presented to respondents, the number of choices of WTP values (data points) offered in the card, and the way the values are distributed (linearly increasing, exponential) or presented to respondents (smaller to largest, largest to smallest, randomly). The results of these tests are generally supportive of the payment card approach as a valid elicitation method (Boyle, 2003; Rowe, Schulze, & Breffle, 1996), while some studies find that bias due to design can exist in some applications (Alberini et al., 2003)

In addition, there is evidence that payment cards tend to produce more conservative estimates of WTP than other elicitation methods, such as dichotomous choice (Champ & Bishop, 2006; Frew Whynes, & Wolstenholme, 2003; Ryan, Scott, & Donaldson, 2004; Welsh & Poe, 1998) and choice experiments (Ryan & Watson, 2009).

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[13] Whereas other studies found no starting point bias (Thayer, 1981). The presence of a starting point bias is thus an empirical rather than systematic issue, but there is sufficient evidence for this to be of concern for researchers.

From the above it can be said there is no clear empirical advantage of payment cards over discreet choice methods, and both could be considered as valid. Still, the payment card format can offer valuable specific characteristics (on starting point bias and statistical efficiency). The format performed well in the pilot conducted for this study. As such, and also as this was the format of choice in the last two studies using this questionnaire (Hoffmann et al., 2012; Krupnick et al., 2006), the payment card approach was used for the Mexico study. For the choice of point values in the payment card a similar structure to Krupnick, Hoffmann, et al. (2006) was followed, adjusted for Mexican purchasing power and expanding the upper range of point values to mitigate against upper bound WTP truncation due to generally higher incomes in Mexico.

3.4. Survey implementation

The survey was conducted during the months of November and December 2014 in the MVMA and applied to a sample of 1,192 residents, aged 40 to 75. This age group is chosen in line with the other studies using the same questionnaire, which focus on the population that is most likely at risk from air pollution, namely the elderly[14], and the population that in tests was shown to be responsive to be WTP for mortality risk reductions (those above 40 years of age). The interviews were conducted door-to-door by a Mexican professional surveying company. Participants were chosen by stratified random sampling by age, gender and socio-economic group to reflect the population of MVMA.

Preceding the implementation of the survey the questionnaire was validated and improved for the Mexican context by in-depth interviews with medical and air quality experts and members of the public (through focus groups), and by input from staff at the National Institute of Ecology and Climate Change (INECC), National Population Council (CONAPO) and the Mexican Health Ministry (Secretaria de Salud). A pilot study was also run with about 600 completed questionnaires. The objective of the review was to keep the questionnaire as close as possible to previous applications (in other countries), so as to ensure international comparability, while making it compatible with Mexican reality. As such only a few key changes were made to language and to content, for example reflecting the structure of the Mexican health insurance system and the risk of death profile of the MVMA population.

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[14] Another group that is also particularly at risk are children. However, specific survey designs are required to measure the WTP (of parents) for reductions in fatality risks for children, which fall outside the scope of the current study. There is some evidence of a 'child-premium', i.e. that parents would be WTP a higher amount to reduce the risk of dying prematurely of their children than the amount they would be WTP for the same risk reduction for themselves (Alberini & Loomes, 2011)

3.5. Acceptance of the scenarios and products

As part of the debriefing following their statements of WTP the respondents are asked a series of questions regarding their acceptance of the scenarios and products described in the questionnaire. Their answers are summarised in table 3. These are broadly in line with the equivalent statistics in the other studies. In general, assessing the acceptance of the risks, scenarios and products presented is necessary to validate and understand the stated WTP of respondents. Regression analyses were used to understand what motivates deviations from the acceptance of the risks, scenarios and products by respondents.

40% of respondents did not believe that the contemporaneous and future risks of dying, presented as representative of their age and gender, were applicable to themselves. 35% of these believed their own risks to be higher and 65% believed them to be lower. Variation in the acceptance of age and gender-specific death risk scenarios is associated with the individual's own health history, but not with their age, gender, income and other socio-economic variables. Those that have been ill or that have sought emergency care in the past 5 years are more likely to believe they have a higher risk of dying than what is presented to them, which indicates that respondents are considering how their own health status might deviate from the mean.

35% of respondents thought that there would be side-effects to consuming the product, which can potentially bias their stated WTP. However, this possible effect on WTP was tested econometrically and the relationship between thinking there would be side-effects and WTP was not statistically significant. 47% of respondents doubted the product would work as described in the questionnaire. This too doesn't have an effect on stated WTP, when controlling for other variables. 40% of respondents thought that there may be other benefits to the product, which could bias their stated WTP upwards. But again this doesn't statistically affect WTP responses.

28% stated they did not consider whether they could afford the product when they answered the WTP question. It was found that respondents making this statement were twice as likely to have answered zero as to have answered with a positive amount to the WTP questions. The respondents stating zero WTP are likely to not have considered their income constraint because they were not willing to pay any amount for the product (regardless of their income), rather than forgetting to take income into consideration when answering. A test on the impact on WTP of not considering affordability by those who stated they would be willing to pay a positive amount for the products did not find an effect on WTP.

Finally, 23% of respondents say they didn't understand that the payments would have to be made once per year over a ten-year period. Here it was found that respondents that are older and have lower incomes are more likely to have misunderstood this instruction. It was also found that those who didn't understand the timing of the payments are WTP significantly more than those who did and to state WTP amounts that are on average unlikely high compared to their reported household income (however this result is driven by only a few observations and these are dropped after the data cleaning process - see section 5).

Table 3 - Acceptance of products and scenario described

	Wave 1	Wave 2	Total
Did not believe risk applied to them	43%	37%	40%
• thought own risks to be higher	32%	39%	35%
• thought own risks to be lower	68%	61%	65%
Thought there would be side effects	34%	36%	35%
Doubted product would work	46%	47%	47%
Thought there would be other benefits to the product	42%	37%	40%
Failed to consider whether they could afford the product	26%	29%	28%
Did not understand they would have to pay once per year over 10 years	21%	25%	23%

3.6. Understanding of probabilities and the choice task

The questions testing understanding of probabilities and understanding of choice task are important in the procedure as they are used as data quality filters (see section 5). It was found that for most measures of these two elements the data performs poorly (including when compared to data from previous studies). The exception here is respondent certainty about their stated WTP.

However, if a time-to-completion of the survey variable is used as an additional filter the results of understanding improve, which indicates that a large proportion of respondents failed the understanding tests because they were not reading the instructions carefully. It is likely that the use of door-to-door surveying without incentivisation led to this relatively large share of failure to understand the survey (data collection procedures in the previous studies varied, but generally relied more heavily on data collection at a centralised location and on incentives for participation, which might have improved data collection procedures). This view is strengthened by the improvement seen to these results in the incentivised online version of the questionnaire that was separately applied (see chapter 3), albeit with the caveat that the population surveyed in the offline and online case is significantly different along socio-economic dimensions. Counterbalancing the high failure rate in the conceptual understanding tests, the total sample size is significantly larger than in previous studies, which allowed the econometric analysis to remain relatively unaffected by the removal of a large share of the starting sample from the analysis through the data cleaning procedures.

Table 4 - Understanding of products and scenarios described

	Wave 1 n = 613	Wave 2 n = 579	Total n = 1,192
Chose the wrong person on the probability of dying question	42%	44%	43%
▪ repeated choice of wrong person when given chance to reconsider (% of the above)	85%	83%	84%
Prefered to be person with the higher chance of dying	19%	18%	19%
▪ confirmed preference when asked to reconsider (% of the above)	43%	48%	46%
Chose both the wrong person in the probability question and prefered to be the person with a higher chance of dying	16%	19%	18%
Had a higher WTP for the smaller risk reduction	17%	26%	22%
Said was unsure about own stated WTP (less than 3 on a 7 point scale)	6%	5%	5%

4. Data quality and data cleaning

The questionnaire includes several checks that are useful to assess the quality of the data collected (each of these checks is called a ‘FLAG’), quality here meaning the level of confidence that the observation adequately represents the respondent’s preferences. The preceding studies that used the same questionnaire found that in some instances a significant proportion of the observations did not pass these data quality checks, which might have an effect on the reliability of results when combined with small sample sizes (Giergiczny, 2010; Ortiz et al., 2009). As such, a large sample of data were collected that would allow for useful subsample sizes even when relatively strict data cleaning controls are applied to the data. Several combinations of data quality checks were tested, which produced several subsamples.

The following data quality checks were considered:

Table 5 – Data quality FLAGs

FLAG	Motive (dummy, = 1 if it meets the criteria)
FLAG0	Illogical response - WTP 5 in 10,000 risk reduction greater than WTP for 10 in 10,000 risk reduction
FLAG0a	WTP 5 in 10,000 risk reduction same as WTP for 10 in 10,000 risk reduction (excluding zero bids)
FLAG1	Gets both probability tests wrong
FLAG2	Prefers higher chance of dying and confirms choice
FLAG3	Does not understand probability well (3 or less on a 7 point scale)
FLAG4	WTP greater than 90% of household income
FLAG5	Reports personal income greater than household income
FLAG6	Protest zeros
FLAG8	Answers in less than 15 minutes or more than 45 minutes

This lead to a choice of four subsamples that were carried on to the regression stage:

Table 6 - Subsamples

Sample	Composition
SAMPLE A	FLAG1
SAMPLE B	FLAG1 and FLAG3
SAMPLE C	FLAG1, FLAG3 and FLAG0
SAMPLE D	FLAG1, FLAG3, FLAG0 and FLAG0a

The software used for the data collection captures time-to-completion information that is used as an additional data quality filter (FLAG8) – if questionnaires have very short completion times it is concluded that the respondent was not engaging seriously with the information in the questionnaire and, if very long, that the completion of the task was particularly complex for that respondent or that she was distracted from the task while completing the questionnaire, both of which might compromise the reliability of her answers (Bonsall & Lythgoe, 2009; Börger, 2015). It was found that a large proportion of respondents answered the questionnaire too quickly to have had time to read the questions properly (49% answered in less than 15 minutes), while only a few took a significantly long time to complete the survey (2% answered in over 45 minutes). Using FLAG8 as a filter in combination with the four subsamples above results in a final total of eight subsamples. The following table shows the number of instances where data are flagged as problematic, as well as the percentage of these in the relevant sample (total sample versus FLAG8 sample).

Table 7 – Effect on data quality of using FLAG8 to drop observations in the sample

	FULL SAMPLE (n = 1,192)		FLAG8 SAMPLE (n = 591)	
	FLAG = 1	%	FLAG = 1	%
FLAG0	166	14	76	13
FLAG0a	762	64	363	61
FLAG1	431	36	131	22
FLAG2	101	8	46	8
FLAG3	64	5	26	4
FLAG4	3	0	1	0
FLAG5	199	17	150	25
FLAG6	55	5	37	6

Note: FLAGs are dummy variables, FLAG = 1 indicates a failure to pass the test.

Generally speaking filtering out data through FLAG8 improves the quality of the data, and noticeably so for the proportion of respondents that pass the probability understanding test (FLAG1).

Still, there are a remarkably large number of respondents falling under FLAG0a (i.e. respondents that are insensitive to scope, but are willing to pay a positive amount for a risk reduction). This may reveal a genuine indifference between a reduction in 5 or 10 in 10,000 from their baseline risk level. It may also be due to problems with comprehension of the scenarios presented or the logic of the questionnaire. Data show that the population in Mexico in our sample's age range perform poorly in functional literacy (OECD & Statistics Canada, 2011). As such FLAG0a is applied as a quality control variable into SAMPLE D.

For some of the stricter data quality filtering procedures large amounts of the full sample data are dropped from the analysis. Note also that FLAG 8 subsamples are marked with an asterisk in the following sections (i.e., sample A refers to full sample minus FLAG1 observations; sample A* refers to full sample minus FLAG1 observations and FLAG8 observations). The impact of the filtering procedures on key descriptive statistics for each subsample is considered in more detail in Annex 2.3.

5. Data analysis

5.1. Scope tests

The questionnaire is designed to make it possible to conduct both internal and external (split sample) scope tests. The NOAA Panel guidelines for contingent valuation surveys (Arrow & Solow, 1993) lists passing scope tests as one of the validity criteria for stated preference surveys. In the internal scope test (i.e. within sample test) it is considered for wave 1 and wave 2 participants separately whether the WTP for a 10 in 10,000 risk reduction is greater than for a 5 in 10,000 risk reduction. The relationship between WTP for a 5 in 10,000 contemporaneous and for a 5 in 10,000 future risk reduction is also analysed.

In the external scope test the validity check is whether the WTP for a 5 in 10,000 risk reduction by wave 1 participants is significantly lower than the WTP for a 10 in 10,000 risk reduction by wave 2 participants. These two measures are the first WTP questions to be seen by the participants in each of the two waves as they progress through the questionnaire, thus ensuring that potential starting point biases are avoided.

A stricter version of the scope test is also considered, whereby answers are checked not only for whether participants are willing to pay more for the larger risk reduction, but also for whether there is a doubling of WTP accompanying the doubling in the mortality risk reduction from 5 to 10 in 10,000.

The analysis started by assessing what the impact of the various data quality filters was on the external scope test results (*p* values) for the full age range (40-75 years old). The external scope test is particularly important as it guarantees avoiding any unwarranted effects from respondents aiming to be internally consistent in their answers to the survey to WTP for the varying levels of risk (which could be driving positive internal scope test results).

The data pass the external scope test, under the conventional statistical confidence levels, for the FLAG8 subsamples only. The data is then further disaggregated into two age groups, of 40-60 and 61-75 (the groups that were and were not asked to value their WTP for a future risk reduction, respectively). Here the findings are that the external scope tests pass for respondents aged 40-60 but not for respondents aged 61-75 (except for subsample D*, which fails for both age groups)[15].

These findings help choose a group of three subsamples which are carried forward for further statistical analysis. By considering the external scope test results in conjunction with the objective of avoiding dropping as much of the data as possible (to keep relevant data variability through to the regression stage), the following three subsamples were settled on: subsample C (applying FLAG1, FLAG0 and FLAG3 restrictions, but keeping FLAG8=1 observations); subsample A* (similar to the simplest filter applied in the other studies that use the same questionnaire, but eliminating questionnaire answers that were considered to have been filled out in an unreasonably quick or lengthy way: FLAG1 and FLAG8); and sample C* (same as C, but with the addition of the FLAG8 restriction). Sample C* performs well on the external scope tests and maintains a reasonably large sample size for regression analysis. The full subsample external scope tests are shown in table 8.

Samples C and C* also pass the internal scope test, meaning that respondents within each of the waves are statistically willing to pay more for a 10 in 10,000 than a 5 in 10,000 risk reduction, whereas sample A* does not. This is also the case for the 40-60 and 61-75 age subgroups (see table 9).

[15] See the 'construct validity' subsection below for a different form of the external scope test, done within a regression framework.

The ratio of WTP values for the two contemporaneous risk reduction levels fails to meet the stricter criteria of being roughly equal to two (corresponding to a doubling in the size of the mortality risk reduction), both in the external and in the internal scope tests. This was also the case in the other studies using the same questionnaire. However, of the values found for this ratio, the Mexican results are the lowest.

From the comparison between current and future willingness-to-pay for a 5 in 10,000 risk reduction it was found that respondents are on average willing to pay more for the future reduction in risk. The implication is that respondents reveal negative discount rates, i.e. they indicate they prefer to delay the positive effects of consuming a product that reduces mortality risk for a later stage in life. This result was consistently found across socio-economic groups in the dataset and for different sample cleaning procedures (as well as in the online version of the questionnaire – see chapter 3).

Negative discounting has been documented in the health choices literature. However, previous studies using this questionnaire all found a (wide) range of positive discount rates. The occurrence of negative discount rates in participants' health choices in our data may be due to time-dependent adaptation effects, whereby respondents' choices for the future are made in relation to the expected baseline health at that future point in time – having a higher overall risk of dying at old age thus being associated with increased valuations for reductions in risk at that age (Loewenstein & Prelec, 1991), or to dread for outcomes more likely to occur in old age, for example by being WTP more to avoid cancer risks than for equally deadly illnesses that could occur with relatively higher probability earlier in life (Hammitt & Liu, 2004; Loewenstein, 1987; Sunstein, 1997). Table 9 shows the results of the internal scope tests for future WTP.

Overall a significant part of the data performs poorly on the scope tests. This was expected to an extent from the experience with the survey in Brazil, the country arguably with the most similar statistical population to the Mexican case[16]. Sample C and D and the FLAG8 samples are those that most approach the Brazilian results. It can be seen that giving illogical responses (FLAG0) and spending little (or, in some cases, a very long) time completing the survey has a significant effect on the scope test results. Also, the scope test results in chapter 3 have a performance similar to the FLAG8 sample results. This shows that one of the key contributors to the poor scope test results is time and effort spent on the survey by participants. One of the key differences between the survey in chapter 3 and the survey in this chapter was participant incentivisation. The average length of

[16] Scope insensitivity problems were also found in the other applications of the survey (see table 12).

time spent by participants in each of the surveys differs significantly, being about 19 minutes in the face-to-face survey (this chapter) and about 27 minutes in the case of the incentivised online survey (chapter 3).Participant incentivisation has been found to significantly affect response quality and participation rates (Göritz, 2006; Singer & Ye, 2013). There are also several studies on the use of incentives in the health survey literature that focus on surveys of consumers of health services (some other studies exist on the incentivisation of surveys of healthcare professionals). These have focused on the effect of incentives on response rates. Broadly, these studies find that incentivisation has a significant and generally large effect on response rates (Aliaga et al., 2011; Beebe et al., 2005; Dykema et al., 2012). No health survey-based studies could be found on the effect of the use versus non-use of incentives on time spent on the questionnaire or on the effect on scope sensitivity. More broadly, problems with scope insensitivity have been found in studies of demand for healthcare (Søgaard et al., 2012; Goldberg & Roosen, 2007; Hammitt & Graham, 1999), and these seem to arise for a variety of reasons (varying with levels of information provision, possible warm-glow effects leading to reduced WTP for larger quantities of the health product, etc.), although these reasons are not consistently found to cause scope sensitivity problems, which complicates controlling for such problems at the study design stage (Baron & Greene, 1996). Another possible contributing factor affecting scope test results between the study in this chapter and the one in chapter 3 was the low level of adult literacy in Mexico mentioned above, which may affect comprehension of the probability of dying scenarios: the levels of literacy were higher in the online survey of chapter 3.

A large sample was collected to allow shedding observations that fail to pass the quality-control filters and to nonetheless obtain a large enough subsample that passed the scope tests. Still there wasn't a data cleaning strategy that produced a subsample that passed the scope tests consistently for both of the main age subgroups in the sample (40 to 60 and 61 to 75 years old).

Sample C* data, the preferred sample, is carried forward in the analysis (dropping the observations of those who responded to the survey too quickly (FLAG8); and those who did not pass the understanding of probability test (FLAG1), those who state they do not understand probability well (FLAG3), and those who show they did not understand or engage with the scenarios adequately by giving illogical responses (FLAG0)). Sample C, which keeps the answers that were given too quickly (i.e. keeping observations that fail the FLAG8 test), is also carried into the analysis stage for comparison purposes with sample C*. Finally sample A* is also kept (dropping observations that were given unreasonably quickly or slowly (FLAG8) and those that fail to pass the understanding of probability test (FLAG1)). Sample A* is the sample most similar to the most common sampling approach taken in the previous research for the other countries.

Table 8 – External scope tests

ZMVM - stated value - external scope tests (respondents 40-75)

	Full sample		Sample A		Sample B		Sample C		Sample D		FLAG8 sample		Sample A*		Sample B*		Sample C*		Sample D*	
	n	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean
Second wave WTP_10	579	1192.9	366	1102.5	350	1124.8	300	1121.9	85	1047.4	291	857.9	224	808.3	216	819.6	189	821.0	57	588.2
First wave WTP_5	613	1322.8	395	1121.1	377	1117.9	326	987.7	91	763.7	300	734.3	236	663.6	232	664.9	207	626.0	62	291.9
p value		0.916		0.568		0.476		0.120		0.131		0.062		0.057		0.049		0.025		0.069
ratio		*0.90*		*0.98*		*1.01*		*1.14*		*1.37*		*1.17*		*1.22*		*1.23*		*1.31*		*2.02*

ZMVM - stated value - external scope tests (respondents 40-60)

	Full sample		Sample A		Sample B		Sample C		Sample D		FLAG8 sample		Sample A*		Sample B*		Sample C*		Sample D*	
	n	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean
Second wave WTP_10	433	1200.4	268	1047.3	261	1049.7	222	1062.7	59	771.6	236	871.7203	178	811.9	174	810.5	152	810.5	43	516
First wave WTP_5	471	1373	295	1114.6	287	1097.4	248	973.4	65	815.4	238	744.958	185	665.4	183	666.9	164	625.6	46	343
p value		0.944		0.714		0.655		0.232		0.568		0.068		0.060		0.067		0.033		0.164
ratio		*0.87*		*0.94*		*0.96*		*1.09*		*0.95*		*1.17*		*1.22*		*1.22*		*1.30*		*1.50*

ZMVM - stated value - external scope tests (respondents 61-75)

	Full sample		Sample A		Sample B		Sample C		Sample D		FLAG8 sample		Sample A*		Sample B*		Sample C*		Sample D*	
	n	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean	*n*	mean
Second wave WTP_10	146	1170.548	98	1253.3	89	1344.9	78	1290.4	26	1673.1	55	798.6364	46	794.0	42	857.1	37	864.9	14	807.1429
First wave WTP_5	142	1156.338	100	1140.5	90	1183.3	78	1033.3	26	634.6	62	693.5484	51	656.9	49	657.1	43	627.9	16	143.75
p value		0.470		0.456		0.275		0.175		0.042		0.316		0.295		0.229		0.214		0.138
ratio		*1.01*		*1.10*		*1.14*		*1.25*		*2.64*		*1.15*		*1.21*		*1.30*		*1.38*		*5.61*

Note: t-tests.

Table 9 – Internal scope tests

ZMVM - stated value - internal scope tests (respondents 40-75)

	Sample C		Sample A*		Sample C*	
	n	mean	*n*	mean	*n*	mean
First wave WTP_10	326	1052.1	236	650.4	207	665.2
First wave WTP_5	326	987.7	236	663.6	207	626.1
p value		0.00		0.78		0.00
ratio		*1.07*		*0.98*		*1.06*
Second wave WTP_10	300	1121.9	224	808.3	189	821.3
Second wave WTP_5	300	1035.5	224	799.2	189	757.1
p value		0.00		0.32		0.00
ratio		*1.08*		*1.01*		*1.08*

ZMVM - stated value - internal scope tests (respondents 40-60)

	Sample C		Sample A*		Sample C*	
	n	mean	*n*	mean	*n*	mean
First wave WTP_10	248	1038.7	295	1090.2	164	667.7
First wave WTP_5	248	973.4	295	1114.6	164	625.6
p value		0.00		0.85		0.00
ratio		*1.07*		*0.98*		*1.07*
Second wave WTP_10	222	1062.7	178	811.9	152	810.7
Second wave WTP_5	222	995.5	178	807.9	152	750.7
p value		0.00		0.42		0.00
ratio		*1.07*		*1.01*		*1.08*

ZMVM - stated value - internal scope tests (respondents 61-75)

	Sample C		Sample A*		Sample C*	
	n	mean	*n*	mean	*n*	mean
First wave WTP_10	78	1094.9	51	615.7	43	655.8
First wave WTP_5	78	1033.3	51	656.9	43	627.9
p value		0.00		0.85		0.03
ratio		*1.06*		*0.94*		*1.04*
Second wave WTP_10	78	1290.4	46	794.0	37	864.9
Second wave WTP_5	78	1149.4	46	765.8	37	783.8
p value		0.00		0.29		0.08
ratio		*1.12*				

Note: t-tests.

Table 10 - Internal scope tests, WTP for future risk reduction

ZMVM - stated value - internal scope tests future WTP (respondents 40-60)						
	Sample C		Sample A*		Sample C*	
	n	mean	*n*	mean	*n*	mean
Future WTP_5	470	1045.3	363	744.2	316	727.5
Present WTP_5	470	983.8	363	735.3	316	685.8
p value		0.00		0.56		0.00
ratio		*1.06*		*1.01*		*1.06*

Note: t-tests.

5.2.Ordering effects

Given that the 5 in 10,000 and 10 in 10,000 risk reduction questions are presented in alternative order in each of the two waves it is possible to test for whether there are any ordering effects in the data (that is, whether the order of the WTP questions affects stated WTP). The ordering effects test considers whether the value of mean WTP for each level of risk reduction is statistically the same across the two waves. It was found that, at the 5% significance level, there generally was no evidence of the existence of ordering effects (failure to reject the null that averages are the same, as indicated by high p-values). Table 11 shows the results of the ordering effects tests.

5.3. Construct validity

A further validation of the stated WTP results is to perform tests on the construct validity of the survey, that is: to observe whether respondent characteristics (socio-economic data and attitudinal data) explain the WTP results and whether the data available shows behaviour consistent with economic theory (for example, one could expect WTP to be explained in part by the income level of the respondent and for respondents with a higher income level to be WTP more for the good being offered, all else equal).

The choice of appropriate econometric model for the construct validity tests is guided by the characteristics of the data, namely:

1) that WTP is a limited dependent variable (LDV) that is lower-bound censored at zero and which is continuous in latent-variable terms; and

2) that the WTP data is expressed in intervals.

Given that the dependent variable is expressed as an interval, four alternative options are chosen for the definition of the relevant measure of WTP for the purposes of the econometric analysis (following Hoffmann et al., 2012):

a) use the lower bound of the WTP interval below stated WTP as the true WTP;

b) assume true WTP lays somewhere within the interval defined by a) and the stated WTP;

c) use the stated WTP value as the true expression of WTP;

d) assume true WTP lays somewhere within the interval defined by stated WTP and the value on the payment card just above that value.

Options d) is likely to constitute the measure that is most consistent with theory (Cameron & Huppert, 1989), as it is unlikely that real WTP would fall systematically precisely on the interval boundary values offered as options to respondents (consequently on the stated value shown on the payment card), and assuming that each respondent seeks to state as close a value as possible to their real WTP, but not a higher value than their real WTP. That is, the purely rational expression of real WTP when confronted with discrete (interval) options to choose from is to choose the highest available value that is just below real WTP. Option c) is a more conservative proxy for real WTP than d), in theory likely to deviate from real WTP due to the imposition of the constraint described above as the respondent has to choose between discrete rather than continuous values. Options a) and b), although fitting less well with the theoretical utility maximisation model used, are intended to provide conservative estimates of WTP[17]. Hoffman et al. (2012) do not estimate option d), presumably seeking to present more conservatives estimates only.

[17] From the perspective of a policy-maker if a proposed policy passes a CBA analysis even when using the conservative estimate of WTP then the case for implementing the policy is particularly strong. There is however a risk that real WTP is higher than the conservative estimate and that cost-effective policies are discarded. From the perspective of researchers, there may be reasons to be concerned that respondent's stated WTP may overestimate real WTP. For example 'prestige effects' may occur, whereby the respondent seeks to impress or please the surveyor by stating a large WTP (Getzner, 2000). Conversely, there may also be reasons to suspect that the respondent's stated WTP is lower than real WTP, for example due to 'consumer-collaboration effects', whereby respondents seek to put downward pressure on a product's market prices (Hanna & Dodge, 1995). The latter may be relevant in the context of the Krupnick et al. suite of studies, in which the present study is included, as the study design is such that the product being described to respondents has the characteristics of a private good rather than a public good (see also the results of the survey sponsor effects analysis in chapter 3). These studies have produced results that have been found to be on the lower end of stated values in meta-analyses of the relevant literature conducted in the USA.

Table 11 - Ordering effects

ZMVM - stated value - ordering effect (respondents 40-75), lower Turnbull

	Sample C		Sample A*		Sample C*	
	n	mean	*n*	mean	*n*	mean
First wave WTP_5	324	792.1	236	527.5	206	493.0
Second wave WTP_5	300	817.5	224	622.9	190	591.7
***p* value**		0.77		0.18		0.19
First wave WTP_10	324	842.0	236	514.4	206	526.2
Second wave WTP_10	300	883.0	224	633.6	190	644.1
***p* value**		0.66		0.10		0.15

ZMVM - stated value - ordering effect (respondents 40-75), lower Weibull distribution

	Sample C		Sample A*		Sample C*	
	n	mean	*n*	mean	*n*	mean
First wave WTP_5	280	916.0	199	625.6	170	597.4
Second wave WTP_5	256	958.0	183	762.4	152	793.6
***p* value**		0.72		0.09		0.09
First wave WTP_10	283	964.0	197	616.2	172	630.2
Second wave WTP_10	257	1030.7	183	775.5	153	799.8
***p* value**		0.59		0.07		0.07

ZMVM - stated value - ordering effect (respondents 40-75), stated value

	Sample C		Sample A*		Sample C*	
	n	mean	*n*	mean	*n*	mean
First wave WTP_5	324	993.5	236	668.6	206	627.2
Second wave WTP_5	300	1030.5	224	794.8	190	758.4
***p* value**		0.73		0.15		0.16
First wave WTP_10	324	1058.0	236	652.1	206	665.5
Second wave WTP_10	300	1116.9	224	808.3	190	822.2
***p* value**		0.62		0.09		0.12

ZMVM - stated value - ordering effect (respondents 40-75), upper Weibull distribution

	Sample C		Sample A*		Sample C*	
	n	mean	*n*	mean	*n*	mean
First wave WTP_5	280	1149.6	199	793.0	170	760.0
Second wave WTP_5	258	1198.3	186	957.1	154	935.7
***p* value**		0.80		0.14		0.12
First wave WTP_10	283	1211.3	197	781.2	172	797.1
Second wave WTP_10	260	1288.8	187	968.2	156	1001.4
***p* value**		0.70		0.12		0.10

Note: t-tests.

This leaves two types of data for input into an econometric model: point-value data that is lower-bound-censored at zero (options a) and c)); and interval data defined by the discrete values on the payment card (options b) and d)). For the point-value data a Tobit model is used, and for the interval data a Weibull model. The Weibull model is a drawn from survival time analysis methods and is used to produce point estimates from interval data (see Hoffmann et al., 2012).

Annex 2.3 shows two regression specifications testing the construct validity for each of the three subsamples, one with a short and one with a long list of potential explanatory variables (upper Weibull example). The contemporaneous WTP regressions pool the data for the first WTP question for each of the two waves (risk reductions of 5 in 10,000 for wave 1 and 10 in 10,000 for wave 2), for ages 40-75. The future WTP regressions use the data for the WTP question for a risk reduction of 5 in 10,000 from both waves, for ages 40-60 (as respondents aged 61 and above are not asked for their WTP for a future reduction in risk they are not included in the future WTP calculations).

For the pooled data in the contemporaneous risk reduction a 5-in-10,000 dummy is included to distinguish what the level of risk reduction evaluated is for each observation (i.e. 5 or 10 in 10,000). This is an alternative form of the external scope test, with the additional effect of the other variables that may affect WTP being controlled for in the regression. It was found that the scope test is passed only for sample C*, at 5% (specification 1) and 10% (specification 2), which is consistent with the non-parametric scope test results in the scope tests subsection above.

For the future risk reduction the respondent's subjective evaluation of their probability of surviving to age 70 was included. Respondents who stated that they have a higher chance of surviving to age 70 are WTP less for a product to reduce their future risk of dying, controlling for other effects (i.e., those who believe to have a lower chance of surviving value more highly reductions of mortality risk at age 70).

Age squared is included to test for non-linearities between age and WTP. For the contemporaneous risk reduction the findings are that age and age squared are significant at the 5% level for specification 1 (samples A* and C* only). However, when other relevant health and socio-economic characteristics are included (specification 2) this effect disappears, except for the linear effect of age in sample C*, but at a 10% significance level. This is due to the introduction of the dummy variable for bronchitis, emphysema or persistent cough, illnesses that are more acute in older ages and seem to drive the age effect in specification 1. There is evidence of unresponsiveness of WTP to age in the previous studies: Krupnick, Alberini & Cropper (2002) find a significant relationship for Canada only above the age of 70 (where WTP is about 30% lower than for those aged 40-70). Evans & Smith (2006) discuss the contradictory evidence that exists in the literature on the relationship between age and WTP and suggest that where a connection can be found this may be due to individuals' cognitive processes varying for different types of risks (thus existing evidence from labour market studies suggesting WTP reduces with age is context-dependent as it is associated with work-related risks). Acknowledging that this issue is not resolved in the literature, the finding for this study is that there isn't sufficient support in the data to defend age adjustments to the VSL for the Mexican case (the so-called 'senior discount' – see U.S. Environmental Protection Agency, 2002; and Aldy & Viscusi, 2007).

For the future risk reductions, however, the findings are that both age and age squared are strongly significant across all samples and model specifications, with a negative and a positive coefficient, respectively. The coefficient on age squared is however quite low, showing a flattish quadratic form. The coefficient on age itself is very large. Further investigation of this coefficient showed that these significant results for age are not robust to varying how the age variables are considered in the specifications (sensitivity testing): using either only age or age squared; using the difference between age and respondent-reported expected age of death (i.e., the individual's subjective life expectancy); using log age instead of age to consider rate of change; or cropping the sample according to age (e.g. considering respondents aged 40-50, 50-60, or 45-55 only) or WTP (removing WTP observations from the tail of the distribution from the sample used in the regression, while maintaining the econometric specifications) consistently leads to insignificant results for the coefficients of the age variables in the future risk reduction specifications. This result is more in line with that for the effect of age on the contemporaneous risk reduction. It is concluded that the significant age coefficients on the future WTP regressions are spurious and should not be considered valid in terms of the construct validity tests as they fail these various sensitiveness tests.

Income in the reported specifications is measured as the logarithm of after-tax household income per family member. Alternative measures of income were tested: total household income and its logarithm, which were both strongly significant in determining WTP; and individual/own income of the respondent and its logarithm, which were found to not significantly explain WTP, either as sole income variables or in combination with household income measures. This suggests that mortality risk reductions expenditures are household-level decisions. The square of household income per family member was also tested as an explanatory variable but it is not significant when combined with the logarithmic measure, and has a lower explanatory power on its own. The income variable is of particular interest in stated preference surveys as it is the independent variable for which a clear theoretical basis exists to link it to the dependent variable (WTP). That is, we would expect that, for goods such as reduction in the risk of dying, an increase in income would result in a greater WTP for the good, all else equal (Hammit, 2000). This is indeed the case across the reported regressions, both contemporaneous and future. The income elasticities (the coefficients on the log income variable) are about 0.2 to 0.3, which are in line with the majority of the other studies using the same survey instrument.

Of the remaining explanatory variables in specification 2 it was found, most notably, that respondents who state they are 'very religious' are willing to pay significantly less than those that who do not[18] (but for sample C*'s future WTP this effect disappears). The motivation for those stating to be very religious to be willing to pay less for mortality risk reductions is unclear. A few subsamples in one of the related studies showed similar results, and a possible explanation offered by the authors is that 'this might be expected on the basis that the greater the faith the more the respondents transfer responsibility to the entities they believe in to protect them' (Ortiz et al., 2009). Another possible explanation is that respondents that state that they are very religious may have less disposable income than others, all else equal, as a part of their yearly income may be given to the church or religious charities and this is not captured in the income questions[19].

6. Value of a statistical life

The VSL is a statistical measure used to monetise reductions in the mortality rate of a population[20]. It is used to compare, under a common unit of value (money), the costs of introducing a public policy that reduces the mortality rate and the benefits of those mortality rate reductions. Once the VSL is determined its application is simple: multiply the number of deaths the policy is estimated to prevent by the VSL (discounting as appropriate).

As discussed, the preferred sampling approach is sample C*, as it offers the best model performance (in particular, it best meets the external validity criteria while keeping a sufficiently large sample

[18] The religion question asks respondents: 'how would you describe yourself?'. The answer options are: 'very religious; somewhat religious; neither religious, nor non-religious; somewhat non-religious; non-religious'.

[19] The income questions ask for respondent's household and personal income, after taxes.

[20] The term 'value of a statistical life' has in some cases been mistakenly taken to mean the value of an individual human life. It is in fact the value of reducing the likelihood of death in a human population by an amount equivalent to one individual in that population. Not monetising explicitly reductions in the probability of dying that would result from public policy is, *de facto*, monetising them implicitly (but less transparently so; see Viscusi, 1993). To avoid the confusion that in some cases the term VSL seems to generate other terms that are deemed clearer have been proposed, such as the 'value of a prevented fatality' or 'value of a mortality risk'.

size[21]). Also, as explained above, the most valid measure of real WTP is that which assumes it is located between the stated value and its next highest value on a payment card (what was called the ‘upper bound Weibull’ value). Finally, and consistently with the studies in other countries applying this questionnaire, the WTP for a 5 in 10,000 risk reduction is used for the recommended VSL calculations[22]. The average WTP value is then calculated to be MXN 843.52. This is about 1.13% of disposable income as reported in the survey. This is at the lower end of the income share of WTP for mortality risk reductions reported in the other studies (closer to Canadian and U.S.A. values than to others). The average WTP converts into a VSL of MXN 1,687,037, or USD 210,880, using the World Bank PPP exchange rate figures of 8 MXN/USD (World Bank, 2011). This VSL is close to the lower bound of those found in Hammitt and Ibarrarán’s wage-risk study (Hammitt & Ibarrarán, 2006).

Table 12 - Comparison of results with the other studies using the same questionnaire

	Mexico MAVM	Mongolia Ulaanbaatar	China Shanghai, Juijiang, Nanning	Canada Hamilton, Ontatio	U.S.A. Entire country	Japan Shizuoke	U.K. Bath	France Strasbourg	Italy 5 cities
WTP (current 5 in 10,000) as a % of average household income	1.13%	3.30%	1.68%	1.00%	1.45%	0.81%	1.59%	7.71%	3.50%
Current VSL: 5/10,000 $US (millions)	0.21	0.25 or 0.57^	0.44	0.93	1.54	0.66	1.17	4.56	2.28
Scope test: ratio of VSLs for 10 vs 5 in 10,000 risk reduction	1.32	1.15	1.21	1.3	1.6	1.5	N/A	?	N/A
Latent VSL: 5/10,000 $US	0.22	0.18 or 0.40^	0.39	0.53	0.69	0.48	0.51	1.25	0.87
Ratio of future to comtemporaneous VSL 5 in 10,000 risk reduction	1.06	0.71	0.9	0.57	0.45	0.73	0.44	0.27	0.38

Note: adapted from Hoffmann et al. (2012). ^ depending on whether official or PPP exchange rate was used; for the remaining countries PPP was used (World Bank, 2010). For Mexico 2011 PPP exchange rate was used.

7. Conclusions

The analysis finds a VSL for Mexico of USD 210,880 (MXN 1,687,037). This value is low compared to the current benefit-transfer values being used in Mexican CBAs. But it is in line with the results

[21] The stricter subsample choice procedure from which sample C* results is also inherently more conservative than the less strict subsample choice procedures: its associated WTP is significantly lower than for the other subsamples, except sample D*. In the case of sample D*, however, sample size is small and significantly less representative of the population.

[22] The VSL resulting from a 5 in 10,000 risk reduction is greater than the VSL resulting from a 10 in 10,000 risk reduction. This is due to the ratio of WTP values associated with the two risk reduction measures not being proportional to the ratio between the two risk reduction values.

found in the studies using the equivalent questionnaire for Japan, Canada and the U.S.A., using share of WTP for a 5 in 10,000 mortality risk reduction over after-tax income for comparison. That is, the benefit-transfer values currently being used in Mexican CBAs seem to be higher than the VSL found from the primary data used here because of 'high' source VSL figures (such as the ones in Kochi, Hubbell, & Kramer, 2006) rather than, for example, due to inappropriate assumptions about income elasticities for transfers between high income countries such as the U.S.A. and a middle income country such as Mexico. The BT source figures that have been used are the result of meta-analysis studies. That is, they combine various estimates of VSL from different papers into a single VSL figure. The meta-analyses done in the U.S.A. that have included studies in that country using an approach that is comparable to the one employed in this chapter show these studies to have produced VSL values that are at the low end of the VSL distribution of all of the studies that were considered. As such it is recommended that in CBAs in Mexico a range of VSL estimates be used, including values that result from benefit transfers, with the value calculated here from primary data being considered a robust conservative estimate of the benefits of mortality risk reductions.

In addition to the calculation of the VSL itself the study also produced results that may be of use to contextualise and apply the findings. These include that there was no support for a senior discount rate, and so that the VSL value can be seen to be representative of the 40 to 75 year population, regardless of age within that group. Also the evidence in this study indicates that health expenditures are household-level decisions rather than individual decisions. This may help guide public policy interventions, for example by lending support to the idea that these interventions should be taking into account the financial situation of a patient's family globally rather than the individual's own ability to pay. Finally the study found a negative discount rate, meaning that individuals are willing to pay more to reduce future risks of dying than to reduce equivalent present-day risks, possibly due to concern with end of life quality.

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Chapter 3

Survey sponsor effects on the willingness to pay for mortality risk reductions

This chapter considers whether the type of entity sponsoring a stated preference survey affects its conclusions. The study is based on a questionnaire on the stated willingness-to-pay (WTP) for marginal reductions in the risk of death (an adapted version of the survey instrument used in chapter 2). The sponsorship of the study is disclosed to the respondents by a logo presented on each of the questions in the webpage. The study was conducted in Mexico to an online panel maintained by a professional surveying company and tested eight different types of survey sponsors (to which respondents were randomly assigned).

The metrics of interest are: 1) those that could affect the conclusions of a stated preference study, namely the stated WTP values ('item response values'); 2) those that reflect how participants engaged with the survey task, namely the survey completion rate; the 'item response rate' (whether respondents skip answering some questions); how much time is spent on the willingness-to-pay questions; and how much time is spent on average on the questionnaire as a whole.

There is a body of literature on how the type of survey sponsor affects answers to questionnaires that goes back to the late 1970s and continues to this day. These studies have been conducted primarily in the fields of cognitive psychology and marketing research and have mainly focused on the effect of survey sponsorship on questionnaire response rates, with some attention also paid to item response values. Such studies have found that survey sponsorship can, in some cases, have an effect on both response rates and item response values.

Survey sponsor effects have however not been investigated in the field of stated preference studies of the type used for environmental and health good valuations. The results of the analyses conducted on the basis of these methods can often take a central role in decision making processes in the public sector (for example, monetary valuations based on stated preference surveys of WTP for reduced mortality risk are used in the cost-benefit analysis of air quality policies) and, in some jurisdictions, can be used in law courts to calculate compensation for damages incurred. It is thus useful to understand whether there is evidence that the responses to stated preference surveys are influenced by who is sponsoring the survey, as if such effects exist and are significant they may have a bearing on these types of decisions.

The main conclusion of the study is that a significant negative effect on WTP was found for sponsorship by government ministries (the Mexican Environment Ministry and the Mexican Health Ministry), when compared to other types of sponsor (a Mexican and a foreign university, three versions of a fictional international development bank, and a version of the questionnaire with no logo inserted, i.e. where sponsorship was not disclosed to participants).

1. Literature background

1.1. Context effects on participant engagement and item response values

The survey sponsor effects literature falls into a broader context effects literature. This literature aims to establish whether there is evidence that survey context influences the processes by which respondents form their answers. Some such effects can be rationalised (for example they can be related to trust in the surveyor) or may be due to cognitive biases caused by seemingly irrelevant information (for example the background colour of a questionnaire).

Context effects can be conceptually separated into verbal context effects and visual context effects. In testing for verbal context effects there is evidence that responses can be framed by the use of language. Schuman & Presser (1981) report that answers to a question can be affected by the content of the previous question. Merolla, Ramakrishnan & Haynes (2013) find that support for immigrant legalisation in the U.S.A. increases if ‘path to citizenship’ is used instead of ‘amnesty’ in the question wording. However varying how immigrants were described in the questionnaire did not have an effect. Harzing, Søndergaard, & Piekkari (2005), in a cross-country study, find that using English language questionnaires reduces differences in the answers obtained across the countries when compared to using questionnaires in each of the local languages. They suggest this indicates that participants may be being nudged to use different value sets when answering questions that are in English, which is something that may be easily by missed by surveyors interested in doing research in multiple countries and using English as the questionnaire language, but where local context is important.

Testing for various visual context effects Tourangeau, Couper & Conrad (2004) find that the way the answer options are graphically presented in an internet survey affects responses. The authors explain this result to be due to the use of interpretative heuristics by the respondents, consciously or unconsciously. Respondents search for reference points using the way options are visually displayed on which to compare the options presented (rather than seeking conceptual reference points on which to contextualise their answers). Christian & Dillman (2004) show that the introduction of symbols with cultural significance in the graphic design (an arrow that suggests implication between items) or the positioning of response items on the answer page significantly affected answers in their survey.

The effect that colour use in paper questionnaires has on response rates has also been found to be significant in some studies (LaGarce & Kuhn, 1995, testing the effect of colour versus black and white questionnaires in a mail survey) but not others (Greer & Lohtia, 1994, testing the effect of different stationery colour; and Jobber & Sanderson, 1983, testing white versus blue questionnaire paper). Labrecque & Milne (2011) find that logo colour affects brand perception and respondents' stated propensity to purchase in a computer-based survey of university students.

The presence of context effects in surveys is, in of itself, perhaps not surprising: context also affects cognitive processes and choices in real life decisions. The question for the surveyor then is whether the context offered by the survey is coherent - or at least minimises differences - with the real-life decision making context for which the survey is aiming to provide insight: having knowledge of the possibility of context effects occurring can aid the surveyor in the design of the survey instrument (Sudman, Bradburn, & Schwarz, 1996) and in the interpretation of its results.

1.2. Context effects in non-market valuation

The non-market valuation of goods and services through stated preference surveys is a set of techniques that is used in several branches of applied economics to elicit economic values where real markets are absent (these techniques are called 'stated preferences' for short). Typically the values elicited through stated preferences may be used in economic cost-benefit analysis at a variety of decision levels, from national legislation to the level of a specific project. These values are also accepted in US courts as monetary measures of physical damages incurred.

Research has been conducted on the existence and consequences of several types of context effects in stated preference surveys. These include: ordering effects (Cai, Cameron, & Gerdes, 2011; Day, Bateman, & Carson, 2012); interviewer effects (Gong & Aadland, 2011; Loureiro & Lotade, 2005); and priming effects (Bonini, Biel, Gärling, & Karlsson, 2002; Pouta, 2004). Proposals to mitigate unwarranted context effects follow from these lines of research, for example by randomizing question ordering or interviewer, by making explicit choices about question ordering (e.g., placing attitudinal questions before other questions), by providing increased levels of information to reduce ambiguity, or by explaining to respondents that context effects may influence their responses.

Several of the proposals in the literature however can only dilute the biases by making them non-systematic rather than seek to remove them, although this could be interpreted as an acceptance that the bias cannot be fully removed or that the nature of the bias is not fully understood although it is known to exist (e.g., question ordering randomisation), and that despite some bias being present the results still offer valid insights into the problem being considered and are independent from unobservable factors (i.e. although the bias is statistically significant it is not sufficient to invalidate the general regression results).

1.3.Motivation: survey sponsor effects and non-market valuation

The possible effects of the identity of the survey sponsors on stated preference outcomes is one area of research on the implications of context that has yet to be explored in the literature. The disclosure of survey sponsor is current practice in the administration of surveys, even while efforts are made to control for other types of potential context bias, often in line with the principle of full disclosure of information to study participants under survey ethics guidelines. As such it is possible that there is an introduction of a systematic effect (bias) on stated preference results due to survey sponsorship that is currently little understood.

For example, stated preference surveys on the willingness to pay for marginal reductions in the risk of death are primarily conducted by academic institutions or by government authorities (or both). The results of these studies are used to derive value of statistical life (VSL) measures, which are used to monetise the expected mortality risk reductions that result from various types of public policy interventions. Also, when government agencies want to agree on a VSL standard to be applied to a range of policies, they frequently make use of meta-analysis studies that aggregate several VSL measures and make recommendations that typically refer to some measure of central statistical representativeness (e.g. the mean of the VSLs), and perhaps to some sensitivity analysis (a range for the VSL around the mean). However, if there is an effect of survey sponsor on the values underlying the

VSLs this may affect the recommended central value and possibly the sensitivity range (as such the type of survey sponsor could be a variable to be included in the meta-analysis regression).

Reasons to hypothesise that survey sponsor effects may exist in stated preference studies can be found in research done in other social sciences, primarily in the fields of cognitive psychology and marketing research. Several of these studies have found an effect of survey sponsor type (government, academia, NGO, private company) on *response rates*. University or government survey sponsors have been found to lead to higher response rates than commercial sponsors (Doob & Freedman, 1973; Fox, Crask, & Kim, 1988; Greer, Chuchinprakarn, & Seshadri, 2000; Jones & Lang, 1980). This is, however, not always the case. For example a meta-analysis by Manfreda, Bosnjak, Berzelak, & Haas (2008) does not find a systematic effect of survey sponsor on survey response rates.

There may also be an impact of survey sponsor on *response values* (i.e. the answers given), and more so if there is a perception by the respondent that the sponsor has a particular view on the survey topic or when the respondent has had prior involvement with the survey sponsor (Groves & Peytcheva, 2008). Galesic & Tourangeau (2007) find a survey sponsor effect on responses to questions on attitudes towards sexual harassment: responses vary with respondents' views on what is the position of the sponsor on the survey subject (neutral/research vs. active/advocacy). A study by Norenzayan & Schwarz (1999) shows that the stated research focus of fictitious academic surveyors affects the focus that is taken by the participants when providing their answers: when asked about the causes for mass murder, participants stated mostly individual or social causes according to whether the surveyor was presented as focusing on individual or social issues, respectively. The study concludes that the respondents are seeking to make their answers relevant to the research goals of the researcher. Significant differences were found even when researchers were both described as belonging to academia but coming from different research fields.

The research on survey sponsor effects has considered survey sponsors by broad types, such as 'government sponsor' or 'academic sponsor' but has only limited insights into whether there is a survey sponsor effect within these types (although the study by Norenzayan & Schwarz (1999) is an example of this type of refinement within academic sponsors). Hypothetically, in the context of stated preferences and derived VSL, it is possible that a survey on willingness to pay to mitigate health risks may be perceived differently should the survey be sponsored by the national health system (focus on medical risks or on personal behaviour and possibly a more frequent contact of the respondent with the survey sponsor) or by the national environmental agency (focus on environmental risks or collective behaviour and possibly only occasional contact with the survey sponsor).

Another possible effect of survey sponsor bias is that of the country origin of the institution doing the survey. This is particularly relevant in a developing country context, where often stated preference surveys are sponsored by foreign entities (international organisations, foreign international development agencies, or foreign research institutions). For example, there may be different levels of trust in a national and in a foreign university; the perceived credibility of the scenario being presented may vary by institution (for example the national university may be perceived to be more strongly able to influence national government policy and thus its stated valuation scenario be seen as more credible than for a foreign university); or respondents may be inclined to please the interviewer (yea saying) or to 'present an ideal self' (for example to project a positive image of the country to outsiders). This type of foreign interviewer bias was found by Henn (2000), where the same stated preference questionnaire on farming resulted in WTP amounts that were some 30% lower when the interviewer was local rather than foreign (although the sample size of interviewers was very small so it is possible that other distinguishing but omitted characteristics affected the results).

It is plausible that a similar effect to the one found in Henn (2000) for face-to-face interviews occurs for sponsoring institutions when the questionnaire is administered online. Online questionnaires are often presented as having the advantage of removing the interviewer bias that has been observed in face-to-face surveys (Duffy, Smith, Terhanian, & Bremer, 2005) and even in surveys conducted over the phone (Gong & Aadland, 2011). However, it is possible that, in the case of online surveys, such interviewer effects are transferred to the type of sponsoring institution, as respondents make a cognitive effort to contextualise their answers.

The literature review did not turn out research on how varying the language in which the sponsor is described might affect survey results, although this may be relevant in cross-country research (for example for international organisations that may have an official name in the local language, in which the survey logo could be described)[23].Finally, it should be noted that this chapter aims only to consider whether different types of survey sponsor effects can be observed in a stated preference survey, not to make a statement about which type of survey sponsor would most likely produce a survey result that

[23] Even if, as was described in the previous section, language can have an effect on answers when the text of the questionnaire itself is in English or in a local language.

would best match a comparable real market outcome. But if a survey sponsor effect is indeed observed this is an issue that could be considered further in future research.

2. Methodology

2.1. Testing for survey sponsor effects

The broad research question to be answered is whether there is a statistically significant effect caused by the type of survey sponsor on relevant variables related to stated preference surveys. And, if such an effect exists, for what type of survey sponsor does it occur and how significant it is. The tests on which the research question is evaluated here are generally derived from the previous findings in the literature (where these are available), reviewed in the previous section, which showed that the some types of survey sponsor can affect survey results, and are each based on pairwise comparisons between two types of survey sponsor[24]. The previous findings in the literature can offer some guidance on what may be expected in terms of significance or signal in the pairwise tests for participant engagement measures, but in some instances there is a relevant research question to justify the pairwise comparison but no previous research that can aid in defining a hypothesis to be tested. Where previous research is not available possible interpretations for results have been set out for the various possible outcomes (should a significant difference be found).

Eight types of survey sponsor were used in the data collection:

- Mexican university (Universidad Iberoamericana Puebla - UIP)
- Foreign university (London School of Economics and Political Science - LSE)
- Mexican Environment Ministry (Secretaría del Medio Ambiente y Recursos Naturales)
- Mexican Health Ministry (Secretaría de Salud)
- Blue international development bank (IDB) logo, in English
- Blue IDB logo, in Spanish
- Red IDB logo, in English
- 'Blank' logo

[24] Using t-tests.

Besides collecting data for the measurement of WTP for mortality risk reductions the online survey captures information that is used to make an assessment of whether there is an effect of the survey sponsor type on participant engagement. The potential effects of survey sponsor are assessed on:

1. participant engagement: drop-out rates (non-completion of the survey), item response rates (number of questions answered), and response lag (time spent on the WTP question pages; and time to complete of the survey);
2. response values: average WTP.

Using the research results found in the existing literature on response rates some hypotheses are formulated for the participant engagement measures for each of the six tests. There is less research on the performance of response values in response to varying survey sponsorship, therefore the default hypothesis is that no survey sponsor effects exist on average WTP. The six main participant engagement tests are as follows:

- Test 1: universities vs government ministries vs international development bank

  It is hypothesised for participant engagement that: Test 1a: the university sponsors outperform other sponsor types (as previous research shows that, when an effect was found, the highest response rates were for university sponsors); Test 1b: the national government ministries outperform the international development bank (as ability to change policy is greater for the former).

- Test 2: foreign university vs national university

  The foreign university outperforms the national university on participant engagement due to ‘pleasing the interviewer’ effects. Alternatively, the foreign university underperforms due to the perception that it has less accessibility to decision-making than the national university. Similarly to Henn (2000) it is possible that the country of origin of the surveyor affects the survey results. There may be different levels of trust in national and foreign universities (for which data was collected); or 'pleasing the interviewer' or 'presenting an ideal self' effects may occur, for example to project a positive image of the country to outsiders. A Mexican university was used as national university (Universidad Iberoamericana Puebla - UIP) and a U.K. university as a foreign university (London School of Economics and Political Science - LSE).

- Test 3: Environment Ministry versus Health Ministry

  This test explores the possibility that a survey on WTP to mitigate health risks may be perceived differently should the survey be sponsored by the national Health Ministry or by the national Environment Ministry. It is hypothesised that participant engagement is higher for the Health Ministry as health policy is perceived to be more immediate in terms of own-health outcomes than environmental policy.

  It is unclear whether there are varying survey sponsor effects within the realm of government surveys. The survey that is used measures WTP to reduce marginal changes to the risk of death, which offers the opportunity to investigate this issue as the question is relevant to both environmental and health policies (and these types of stated preference surveys are often sponsored by these different types of government institution).

- Test 4: Spanish language logo versus English language logo

  It is hypothesised that participant engagement is higher with the Spanish (local language) logo than with the English logo. The remaining logo elements (colour, composition, and placement) are essentially maintained across the two relevant survey subsamples for each language. A fictional international development bank (IDB) is used ('International Development Bank'; 'Banco Internacional para el Desarollo').

  This is motivated by the World Bank having used the same basic survey instrument that is used in this study in non-English speaking countries: China (Krupnick et al., 2006; Krupnick, Hoffmann, & Qin, 2010) and Mongolia (Hoffmann et al., 2012)[25]. One possible route by which a logo language effect could happen is signalling the level of institutional expertise in the country of application, whereby a logo in the local language would indicate a higher level of local knowledge or engagement with local issues. This test may also assist in unpacking the elements affecting any potential differences between the national and foreign university.

[25] It wasn't possible to obtain information regarding the language used in the logo in these two surveys.

- Test 5: blue logo versus red logo

  This is a visual context test in which the effect of logo colour on stated willingness-to-pay is observed. The expectation is that no effect on participant engagement is found.

- Test 6: no logo

  In addition, a version of the survey with no logo inserted was included (i.e. an unidentified survey sponsor, termed 'blank logo' in what follows) to assess how removing the survey sponsor as an anchor for participants would affect survey performance, when compared to the other logo versions. For example, it is possible that removing mention to the survey sponsor completely may give an indication of what may be unbiased answers to the WTP question, as long as measures of participant engagement in the survey are not affected by that removal.

2.2. Survey instrument

The behaviour of the WTP predictions under the various survey sponsor types is tested by means of scope tests and construct validity tests. Further discussion on these tests can be found in chapter 2. The scope tests are used to confirm that WTP for a 5 in 10,000 mortality risk reduction is lower than WTP for a 10 in 10,000 mortality risk reduction. The construct validity assessment is performed by regressing the WTP values on a set of explanatory variables to observe whether WTP results can be meaningfully explained by those explanatory variables and to establish whether the statistical relationships conform to what would be expected from theory. This latter theoretical validity test typically rests on confirming that the relationship between WTP and income is positive and significant, as income is the only independent variable in the stated preference models for which a clear theoretical relationship with WTP can be established.

The data were collected through a version of a questionnaire that has previously been used in several stated preference studies to measure willingness-to-pay for mortality risk reductions (Alberini, Cropper, Krupnick, & Simon, 2004; Hoffmann et al., 2012; Itaoka, Krupnick, & Akai, 2007; Krupnick et al., 2006; Krupnick, Alberini, & Cropper, 2002; Krupnick, Alberini, Simon, & Itaoka, 2005; Krupnick et al., 2010; as well as in chapter 2 to calculate a VSL for Mexico). The questionnaire was distributed online to a target group of those living in the most populated metropolitan areas in Mexico by a survey company. The panel of respondents was aged 40 to 50 years old. The respondents were randomly assigned to one of eight groups, each identified with a different survey sponsor type.

The questionnaire had previously been adapted to the Mexican reality (after being tested in focus groups changes were made to the original questionnaire that included the presentation of leading causes of death for males and females by age group in Mexico, relevant health insurance options available to Mexicans, etc.), augmented by a few questions (all placed at the end of the questionnaire, without the possibility of returning to change answers to avoid affecting results in unforeseen ways), translated into Spanish[26], and used for offline (face-to-face) data collection for the purpose of estimating a value of statistical life (VSL) for Mexico. The Mexican version of the questionnaire is further detailed in chapter 2.

Given the focus on testing survey sponsor effects the offline survey was further adjusted to meet resource constraints. Most fundamentally this was done by dropping the previous study design of two 'waves' for the mortality risk reduction valuation questions, with the questionnaire used here keeping only one wave[27]. As inclusion in one of the waves in the original surveys was random (i.e. about 50% of participants would be assigned into each of the waves) this change allowed the testing of eight instead of four survey sponsor types under the available budget, but had the analytical cost of removing the ability to test for ordering effects and external validity under the different survey sponsor options (only internal validity scope tests are possible). Also, the age of the respondents was limited to 40 to 50 years old (in the original survey the age range had been 40 to 75 years old). This allowed a reduction of the overall sample size needed to do the analysis but reduced the possibility of analysing in more detail the effect of interactions between age and survey sponsor that might have been of interest. The final sample can be split along two age groups from the original seven: 40 to 45 year olds, and 46 to 50 year olds. The participants were asked for their gender[28] and then randomly assigned to see one of the logos as a header on their survey, with the logos all of the same approximate size and placed in the same position on the page, as exemplified in figure 3[29].

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[26] With the assistance of staff in the Environmental Economics and Policy Research Unit at the Mexican National Institute of Ecology and Climate Change (INECC).

[27] The wave that is kept shows a contemporaneous 5 in 10,000 risk reduction WTP question followed by a contemporaneous 10 in 10,000 risk reduction WTP question; the presentation of the latent 5 in 10,000 risk reduction WTP question remained in third place, after the two contemporaneous risk reduction WTP questions.

[28] The questionnaire contains information that is age and gender specific (the leading causes of death per age group and gender, related medical and non-medical actions that can be taken to mitigate the risk of death and the baseline mortality risk for the respondent's profile).

[29] The seven logos used (i.e. excluding the 'blank' logo version, which shows no logo) can be found in Annex 3.3.

3. Data and results

The questionnaire was sent out to an online panel of 8,500 individual respondents[30] in Mexico, with reminders sent to participate if the respondent had still not answered the survey. Of these, 4,175 unique respondents started the survey (49% of the panel), with 3,616 reaching the end (43% of the panel; 87% of those who started it) and 559 not (7% of the panel; 13% of those who started it)[31]. Table 13 shows the distribution of the sample by age and gender.

3.1. Participant engagement

The first analysis of whether the different survey sponsor types affect participant behaviour is on their engagement with the survey. Participant engagement is defined as the amount of effort dedicated by the individual to the completion of the task of filling out the questionnaire. Four measures of participant engagement are considered:

- survey completion rates (percentage of individuals reaching the end of the survey);
- item response rates (share of respondents reaching the end who skip answering some questions);
- time spent on the WTP questions; and
- time spent on the questionnaire from start to end[32].

An assessment of the existence of statistical differences between the eight sponsor types for these four measures is performed for the six survey sponsor tests described in section 3 (universities vs government ministries vs international development bank; foreign university vs national university; etc.). The full results of the analysis can be found in Annex 3.2.

- **Survey completion rate**

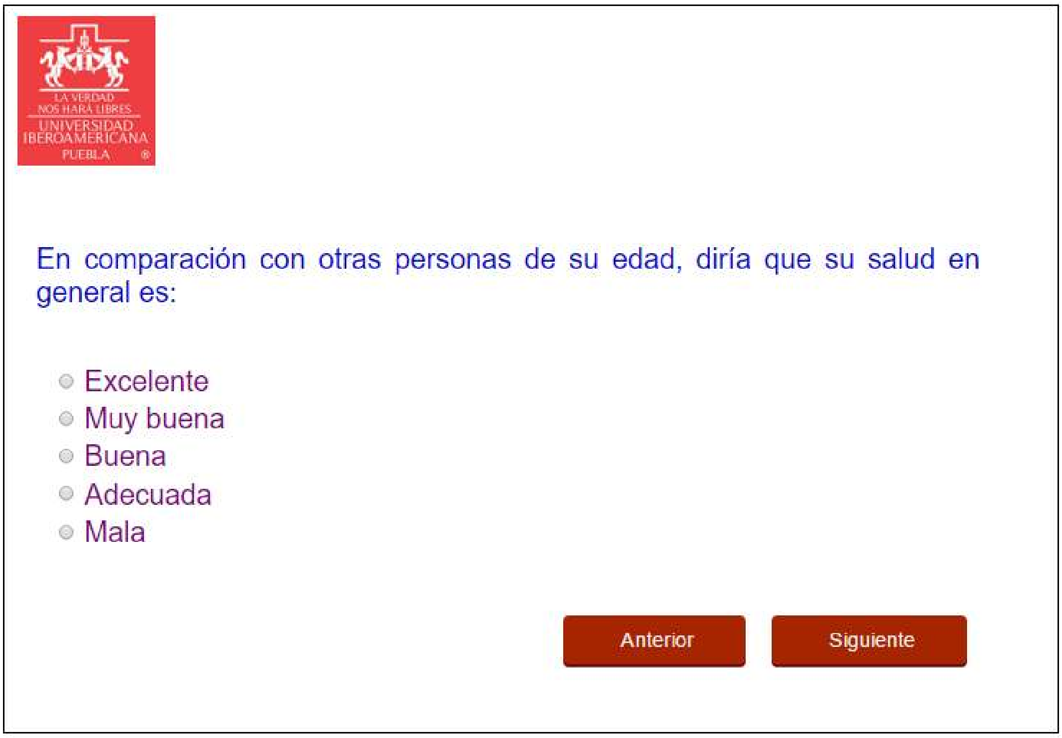
The survey completion rate can be interpreted as one measure of the average importance attached to the survey by participants. A survey considered as very relevant by the participants should result in a

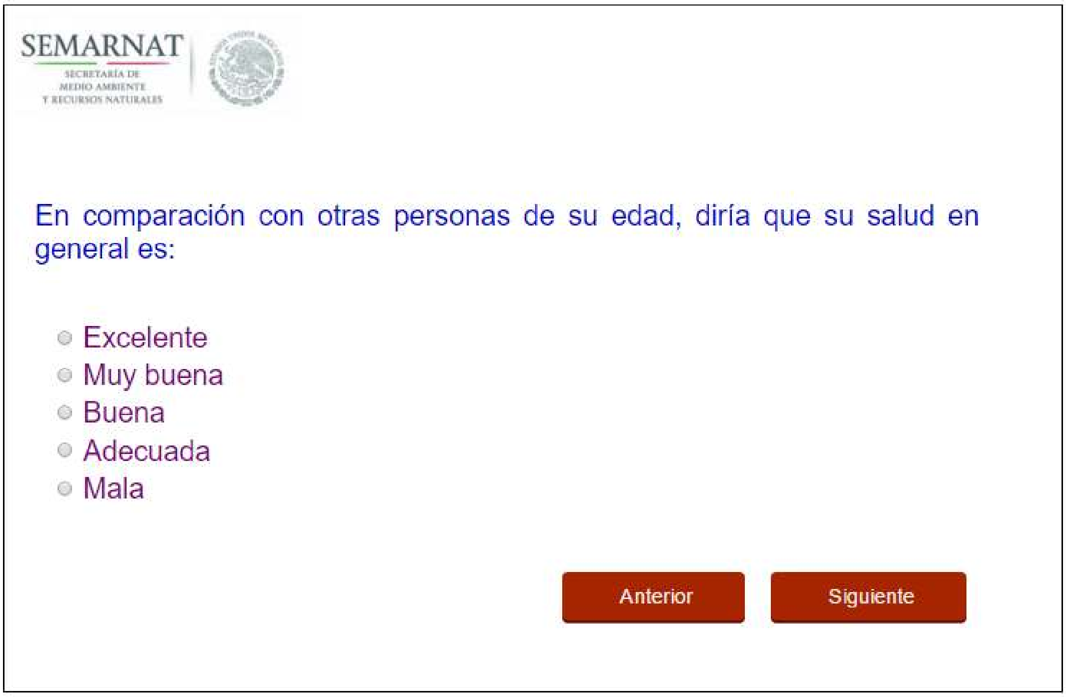
[30] Owned by Netquest, a surveying company with a large panel of respondents in Mexico. Several surveying companies were considered and a choice was made based on cost, panel quality controls (including incentivisation), and panel size.

[31] Several of the respondents that reached the end of the survey did not complete all of the questions in the survey. In the regression specifications responses with relevant missing data are dropped.

[32] Participant engagement statistics per survey type can be found in Annex 3.1.

Figure 3 – Example of questionnaire page and logo positioning on the page





higher survey completion rate. The t-test results for this measure show limited evidence of differences between the survey sponsors (tests 2 to 6, as described in the previous section). The one exception is for the Mexican university, which attracts a higher completion rate than the Environment Ministry and the blank logo (at 5% significance), but does not outperform the remaining survey sponsor types. The higher completion rates for the Mexican university than for the Environment Ministry and the blank logo are consistent with the previous literature results underpinning the hypothesis in test 1A, namely that university sponsors attract higher response rates than other survey sponsor types. Perhaps more interesting here, however, is that the Mexican university did not, contrary to expectations, outperform the majority of other survey sponsor types. Equally, government sponsors did not outperform other sponsors in terms of survey completion rates, which indicates that ability to influence policy is not a strong determinant of completion rates (test 1b).

- **Item response rate**

The item response rate is also a measure of survey relevance to participants. The results in Annex 3.2 show significantly higher missing data for the red logo IDB survey than the Environment Ministry, the Spanish logo IDB, the blue logo IDB (test 5; 5% significance) and the blank logo (test 6; 1% significance)[33]. The expectation for test 5 was that no effect would be found for the pairwise tests on the colour logos for the various measures of participant engagement. In the few instances where colour has had an effect on response rates in the existing survey sponsor effects literature this effect has been interpreted through the lens of 'colour psychology', whereby different colours have different interpretations and evoke different emotional responses in individuals, either innate or learned (Crozier, 1999). In surveys of emotional response to colour, blue tends to be more likeable than other colours, including red, and is associated with calmness and peacefulness. Red tends to be seen as more emotional and active, and to stand out in meaning from other colours, which tend to be more clustered together in terms of emotional interpretation (Madden et al., 2000). Elliot et al. found in several studies that even limited participant exposure to the colour red impaired cognitive function, resulting in lower scores and less effort in a range of tests (Elliot & Maier, 2007; Elliot et al., 2007), which is consistent with the few instances here where red is linked to lower response rates than the immediately comparable blue (English and Spanish) and blank logos.

[33] A negative t-test for item response rates means that the average occurrence of missing data is lower in the first than in the second type of survey sponsor in the test.

Table 13 - Distribution of the sample by age group, gender and logo version

Logo	Age group	Male	Female	Logo	Age group	Male	Female
Mexican university	**40 - 45**	205	185	**Blue IDB**	**40 - 45**	155	218
		72.4%	*67.5%*			*64.9%*	*71.0%*
	46-50	78	89		**46-50**	84	89
		27.6%	*32.5%*			*35.1%*	*29.0%*
	Total	283	274		**Total**	239	307
Foreign university	**40 - 45**	192	178	**Red IDB**	**40 - 45**	175	181
		72.2%	*73.3%*			*67.3%*	*73.9%*
	46-50	74	65		**46-50**	85	64
		27.8%	*26.7%*			*32.7%*	*26.1%*
	Total	266	243		**Total**	260	245
Environment Ministry	**40 - 45**	165	202	**Spanish IDB**	**40 - 45**	154	186
		66.5%	*74.3%*			*68.8%*	*69.1%*
	46-50	83	70		**46-50**	70	83
		33.5%	*25.7%*			*31.3%*	*30.9%*
	Total	248	272		**Total**	224	269
Health Ministry	**40 - 45**	175	198	**Blank logo**	**40 - 45**	163	171
		69.4%	*69.2%*			*65.2%*	*66.5%*
	46-50	77	88		**46-50**	87	86
		30.6%	*30.8%*			*34.8%*	*33.5%*
	Total	252	286		**Total**	250	257
Male	**40 - 45**	1,384		**Female**	**40 - 45**	1,519	
		68.4%				*70.6%*	
	46-50	638			**46-50**	634	
		31.6%				*29.4%*	
	Total male	2,022			**Total female**	2,153	

In addition, the blank logo survey had less missing data on average than the Mexican university, the Foreign university and the Health Ministry (10% significance), indicating some trade-off between survey completion rates and item response rates for the blank logo, which make it difficult to interpret directly its effect on effort made by respondents (test 6). The remaining pairwise tests showed no statistical differences.

- **Time spent on willingness to pay questions**

There were three WTP questions to be answered, in this order: WTP for a 5 in 10,000 contemporaneous risk reduction; WTP for a 10 in 10,000 contemporaneous risk reduction; and WTP for a 5 in 10,000 latent (future) risk reduction (a reduction from baseline risk at age 70 to 80 years old). A significant amount of text between the three questions is similar, as such it was expected that time spent on the WTP questions will go down from the first to the second and third questions, which was verified (there was little difference in general between time spent in the second and third question). As an approximation to respondent behaviour, an informal assessment is made of the minimum time needed to comprehend fully and answer the *first question* (WTP for a contemporaneous 5 in 10,000 mortality risk reduction) and this is set at a minimum of 25 seconds. Answers given after 2 minutes are considered to have taken unnecessarily long (possibly due to the participant doing other things while completing the survey, thus making it less clear whether sufficient attention was given to the WTP question). Answers given in less than 5 seconds indicate the participant did not attempt to understand the question. Answers between 5 and 15 seconds would have allowed for a very cursory understanding of the question. Finally, answers between 15 and 25 seconds are considered to have given enough time to read through the question but little time to consider the answer.

Testing was done on the statistical differences between the survey sponsor types for those spending between 25 seconds and 2 minutes on the first WTP question. Significantly more respondents spent this amount of time answering the WTP question for the blue logo IDB option than for the Environment Ministry option (1% significance level), the Mexican university sponsor, red logo IDB sponsor, blank logo sponsor (5% significance) and the foreign university sponsor (10% significance). Longer than average effects were also found, in some of the tests, for the Spanish language IDB (also in blue) and the Health Ministry (10% significance). Colour psychology could again be used as a possible way to interpret some of these results (test 5; see also previous point). Blue logos outperform red and blank logos on time spent on the WTP question, with blue being associated with a calmer state of mind and increased focus.

In comparison, on the underperforming side, the universities and the Environment Ministry see a smaller proportion of participants spending 'sufficient' time on the WTP question (test 1 and test 3). A possible interpretation for the university and Environment Ministry results is that fewer participants are seeing these as representing credible agents for the mortality reduction product being offered. So although universities have a standard performance in other participant engagement measures (or even, in some of the tests, outperforming, with the Mexican university showing stronger questionnaire completion rates than some of the other logos), when the crucial WTP question is presented respondents seem to not be as engaged as for other logos. The remaining pairwise tests showed no statistical differences.

- **Time to complete the survey**

The last measurement of participant engagement considered was time to reach the end of the survey per survey sponsor type. No statistically significant differences were found in any of the tests.

In general, and according to the tests conducted, there is limited evidence that varying the survey sponsor has a systematic effect on participant engagement for each type of survey sponsor (i.e. that a significant and consistent effect is found for the same survey sponsor tests across the participant engagement measures). . It can be said that the question of how survey sponsor affects participant engagement is not a straightforward one. For the various participant engagement measures considered some logos may outperform others in some of the tests, but underperform in others. Care should be taken when conducting research on respondent effort to make a multi-dimensional assessment of effort, rather than focus on a single measure as fully representative of participant engagement.

A further question is whether these measurements of participant engagement are of consequence to WTP once other explanatory factors have been taken into account. This is considered further in the construct validity section below for the cases of time spent on the first WTP question and time to reach the end of the questionnaire[34].

3.2. Scope tests

Scope tests are typically used to establish whether the data perform in line with theoretical predictions. For example, it is expected that offering more of a good should lead to an increase in WTP for the new

[34] Inclusion in the WTP regressions is not possible for the other two participant engagement measures as the regressions drop observations with missing values.

quantity. It is also generally expected that WTP for receiving a good in the future should be less than WTP for receiving that good in the present time, due to the general presence of positive discount rates in intertemporal choices (but see discussion on negative discounting in chapter 2). In addition, within the analysis of the effects of varying the survey sponsor on average WTP for mortality risk reductions, scope tests can also be seen as an additional measure of participant engagement: on the one hand if varying the survey sponsor has no effect on the outcomes of the scope tests this indicates that participants were equally engaged in the survey task across survey sponsor types. If, on the other hand, there is a significant effect of survey sponsor type on the behaviour of the data under the scope tests then this could indicate that common validity tests in the literature may be affected by survey sponsor type (for example if the scope tests are passed for some survey types but not for others)[35].

The scope tests for the various survey sponsor types are shown in table 14, where three sub-samples were considered in an effort to improve data quality (see chapter 2 for a fuller discussion of the types of filters used to improve data quality here): (sub) sample A excludes observations where both probability tests were answered incorrectly (this indicates a poor comprehension of the task or just clicking through the questions); sample C builds on sample A and further excludes observations where WTP for a 5 in 10,000 mortality risk reduction is greater than WTP for a 10 in 10,000 mortality risk reduction (i.e., illogical WTP responses if it is assumed people would prefer to receive greater risk reductions all else equal), as well as those that state that they do not understand probability well (indicating that they cannot understand the task sufficiently well, at least with the assistance offered in the questionnaire, to make an informed judgement); finally sample Z, in addition to sample C, uses the participant engagement measures from the previous section as further data filters, also dropping those taking more than 1h30 to answer, those not answering 7 or more of the questions, and those spending less than 25 seconds or more than 2 minutes on the first WTP question.

Using the three subsamples reduces the overall sample size from 3,501 (those that reached the end of the survey and answered the WTP questions) to 3,241 observations for sample A (7.4% reduction); 2,957 observations for sample C (15.5% reduction); and 1,866 observations for sample Z (46.7% reduction). Moving from sample A to sample C generally has a small effect on sample size reduction and on average WTP. Moving from sample C to sample Z, however, has a large effect on sample size and leads to a larger average WTP.

[35] As mentioned above the survey design does not allow for external scope tests, only for internal scope tests.

The internal scope tests for the contemporaneous risk reduction are passed comfortably for all survey sponsors and subsamples, indicating that respondents are willing to pay significantly more for the larger risk reduction. The doubling of the risk reduction offered does not, however, lead to a doubling of average WTP (the stricter version of the internal scope test). The increase is between 10% and 29%, with the Environment Ministry and the Health Ministry performing slightly less well than the other survey sponsor types on this measure.

The internal scope tests for the latent risk generally fail to find statistically significant differences for the different survey sponsors and subsamples, with the exception of the Spanish IDB logo and the blank logo (5% significance). In these two cases they show a higher WTP for the latent risk reduction than for the contemporaneous risk reduction, indicating a negative discount rate. This is a result that was also found for the face-to-face version of the questionnaire (see chapter 2 for a discussion on negative discounting).

Finally, there is little impact of dropping what were defined as 'low participant engagement' observations (i.e. sample Z) on the quality of the scope tests (i.e., whether behaviour is in line with theoretical expectations). However, dropping these observations does reduce the sample size significantly. As such using the sample Z is considered not to be beneficial and this sample is not used further in the analysis.

3.3.Differences between WTP values

In terms of policy implications, the main question regarding the existence of possible survey sponsor effects is whether such effects substantially affect WTP estimates. If the disclosure of the survey sponsor to the participants significantly affects WTP measures then, by implication, that disclosure also affects impact assessments (and, in some jurisdictions, estimates of damages for use in legal decisions). No evidence was found in the literature that this issue has been previously considered suggesting that surveyors have previously assumed that respondents would not be affected by the nature of the publicised sponsor of stated preference surveys.

To assess the existence of survey sponsor effects on average stated WTP for mortality risk reductions a series of t-test comparisons were run for each of the tests described in section 3. The results of the t-test are presented in table 16. Most of the t-test comparisons result in no statistical differences having been found between survey sponsor types. Significant differences emerge more clearly between the Environment Ministry survey sponsor and several of the other sponsor types (all except the red logo IDB and the Health Ministry). Where a difference was found for the Environment Ministry, stated WTP values are consistently lower than the equivalent values for the other survey sponsor types. In addition, several of the t-tests also indicate that the use of the Health Ministry logo or of the red version of the IDB logo is associated with significantly lower WTP estimates.

These t-tests do not, however, control for any possible differences in the composition of the various survey sponsor subsamples that may have arisen despite the randomised allocation of participants to each survey sponsor group. A test is conducted in the next section for whether these effects persist when other statistical effects that may influence WTP are accounted for.

3.4. Construct validity

The model includes a large number of variables[36], which are divided into groups by their nature: socio-economic, health, survey sponsor type, participant engagement, understanding and acceptance of survey scenarios, and metropolitan area dummies. The results for the regression of stated WTP values on the explanatory variables are shown in table 17 (contemporaneous risk WTP, 5 and 10 in 10,000 reductions in mortality risk; and latent risk WTP, a 5 in 10,000 reduction). A Tobit regression with heteroscedasticity-robust standard errors was used, given the left-censored-at-zero nature of the data. The sample A and sample C filters were used in the analysis, as described in the previous section.

In terms of theoretically validity it can be observed that the income variable is positive and strongly significant in all specifications, which is in accordance with what would be expected: respondents with higher incomes are willing to pay more in absolute terms for mortality risk reductions than those with lower incomes. For the remaining socio-economic variables the most notable statistically significant effects were found for: the degree of religiousness of the respondent, with those stating to be 'very religious' willing to pay significantly less for mortality risk reductions (this is a similar result to the one found in chapter 2 for the offline application of the survey); gender, with women generally willing to pay less than men; and whether respondents had their own private insurance policy (and no other form of insurance), in which case willingness-to-pay was higher. The age range in the sample is narrow, from 40 to 50 years old, which limits the ability to draw meaningful conclusions on the relationship between age and WTP, but it was nonetheless interesting to find that WTP significantly increases with age for the

[36] There was no issue with multicollinearity, tested using Stata's `VIF` command. All variance inflation factors had a score below 2. This was confirmed by the low values in the post-estimation correlation matrix.

Table 14 - Internal scope tests, contemporaneous risk (5 vs 10 in 10,000 risk reduction)

		Sample A		Sample C		Sample Z	
		n	mean	*n*	mean	*n*	mean
Mexican University	WTP_10	466	3040.8	423	3054.8	255	3314.2
	WTP_5	466	2638.2	423	2394.5	255	2620.5
	p value		0.00		0.00		0.00
	ratio		*1.15*		*1.28*		*1.26*
Foreign University	WTP_10	394	3282.9	359	3279.0	226	3654.6
	WTP_5	394	2752.7	359	2591.5	226	2973.6
	p value		0.00		0.00		0.00
	ratio		*1.19*		*1.27*		*1.23*
Environment Ministry	WTP_10	389	2317.2	353	2380.3	214	2383.2
	WTP_5	389	2113.6	353	1967.2	214	1953.9
	p value		0.00		0.00		0.00
	ratio		*1.10*		*1.21*		*1.22*
Health Ministry	WTP_10	430	2653.6	390	2648.8	249	2822.5
	WTP_5	430	2336.2	390	2168.3	249	2318.7
	p value		0.00		0.00		0.00
	ratio		*1.14*		*1.22*		*1.22*
International Development Bank - blue logo	WTP_10	426	3118.0	395	3166.7	272	3177.3
	WTP_5	426	2578.1	395	2454.6	272	2452.4
	p value		0.00		0.00		0.00
	ratio		*1.21*		*1.29*		*1.30*
International Development Bank - red logo	WTP_10	380	2649.7	354	2753.9	214	3012.0
	WTP_5	380	2234.4	354	2189.8	214	2439.0
	p value		0.00		0.00		0.00
	ratio		*1.19*		*1.26*		*1.23*
International Development Bank - Spanish logo	WTP_10	369	3031.2	341	3066.6	226	3048.7
	WTP_5	369	2580.8	341	2428.9	226	2470.4
	p value		0.00		0.00		0.00
	ratio		*1.17*		*1.26*		*1.23*
Blank logo	WTP_10	387	3160.3	342	3204.1	210	3374.1
	WTP_5	387	2822.4	342	2533.0	210	2641.8
	p value		0.00		0.00		0.00
	ratio		*1.12*		*1.26*		*1.28*

Note: t-tests.

Table 15 - Internal scope tests, latent risk (present 5 vs future 5 in 10,000 risk reduction)

Mexican University		Sample A		Sample C		Sample Z	
		n	mean	*n*	mean	*n*	mean
	WTP_future	452	2665.4	410	2604.0	255	2730.5
	WTP_5	452	2675.0	410	2425.8	255	2620.5
	p value		0.94		0.15		0.52
	ratio		*1.00*		*1.07*		*1.04*

Foreign University		Sample A		Sample C		Sample Z	
		n	mean	*n*	mean	*n*	mean
	WTP_future	394	2804.3	359	2712.9	226	2942.2
	WTP_5	394	2752.7	359	2591.5	226	2973.6
	p value		0.68		0.33		0.85
	ratio		*1.02*		*1.05*		*0.99*

Environment Ministry		Sample A		Sample C		Sample Z	
		n	mean	*n*	mean	*n*	mean
	WTP_future	389	2132.8	353	2136.3	214	2084.1
	WTP_5	389	2113.6	353	1967.2	214	1953.9
	p value		0.86		0.72		0.25
	ratio		*1.01*		*1.09*		*1.07*

Health Ministry		Sample A		Sample C		Sample Z	
		n	mean	*n*	mean	*n*	mean
	WTP_future	430	2381.8	390	2309.6	249	2490.6
	WTP_5	430	2336.2	390	2168.3	249	2318.7
	p value		0.68		0.21		0.21
	ratio		*1.02*		*1.07*		*1.07*

International Development Bank - blue logo		Sample A		Sample C		Sample Z	
		n	mean	*n*	mean	*n*	mean
	WTP_future	426	2646.0	395	2657.3	272	2613.2
	WTP_5	426	2578.1	395	2454.6	272	2452.4
	p value		0.64		0.14		0.36
	ratio		*1.03*		*1.08*		*1.07*

International Development Bank - red logo		Sample A		Sample C		Sample Z	
		n	mean	*n*	mean	*n*	mean
	WTP_future	380	2346.1	354	2348.1	214	2487.4
	WTP_5	380	2234.4	354	2189.8	214	2439.0
	p value		0.31		0.15		0.74
	ratio		*1.05*		*1.07*		*1.02*

International Development Bank - Spanish logo		Sample A		Sample C		Sample Z	
		n	mean	*n*	mean	*n*	mean
	WTP_future	369	2825.3	341	2835.4	226	2843.8
	WTP_5	369	2580.8	341	2428.9	226	2470.4
	p value		0.09		0.00		0.03
	ratio		*1.09*		*1.17*		*1.15*

Blank logo		Sample A		Sample C		Sample Z	
		n	mean	*n*	mean	*n*	mean
	WTP_future	387	2924.4	342	2952.6	210	3109.2
	WTP_5	387	2822.4	342	2533.0	210	2641.8
	p value		0.49		0.00		0.00
	ratio		*1.04*		*1.17*		*1.18*

Note: t-tests.

Table 16 - t-tests for differences in mean WTP for different survey sponsor types

	Contemporaneous				Latent	
	WTP_5		WTP_10		WTP _5	
	Sample A	Sample C	Sample A	Sample C	Sample A	Sample C
Test 1						
Mexican Univ. Vs Health Min.	1.401	1.096	1.685*	1.670*	1.177	1.191
Mexican Univ. Vs Env. Min.	2.363**	2.008**	3.062***	2.708***	2.227**	1.886*
Mexican Univ. Vs blue logo IDB	0.406	-0.127	-0.154	-0.285	0.081	-0.217
Mexican Univ. Vs red logo IDB	1.878*	1.035	1.690*	1.263	1.329	1.044
Mexican Univ. Vs Spanish logo IDB	0.374	-0.013	0.179	0.089	-0.613	-0.861
Foreign Univ. Vs Health Min.	1.649*	1.655*	2.323**	2.208**	1.649*	1.528
Foreign Univ. Vs Env. Min.	2.584***	2.504**	3.618***	3.170***	2.644***	2.177**
Foreign Univ. Vs blue logo IDB	0.701	0.554	0.613	0.396	0.620	0.212
Foreign Univ. Vs red logo IDB	2.125**	1.615	2.322**	1.820*	1.797*	1.394
Foreign Univ. Vs Spanish logo IDB	0.655	0.618	0.874	0.700	-0.076	-0.427
Health Min. Vs blue logo IDB	-1.016	-1.221	-1.881*	-2.004**	-1.110	-1.423
Health Min. Vs red logo IDB	0.437	-0.091	0.016	-0.401	0.151	-0.159
Health Min. Vs Spanish logo IDB	-0.976	-1.044	-1.431	-1.513	-1.717*	-1.967**
Env. Min. Vs blue logo IDB	-2.000**	-2.146**	-3.318***	-3.084***	-2.186**	-2.131**
Env. Min. Vs red logo IDB	-0.539	-0.984	-1.376	-1.454	-0.923	-0.8777
Env. Min. Vs Spanish logo IDB	-1.916*	-1.914*	-2.769***	-2.520**	-2.609***	-2.714***
Test 2						
Mexican Univ. Vs Foreign Univ.	-0.307	-0.669	-0.742	-0.648	-0.538	-0.411
Test 3						
Env. Min. Vs Health Min.	-0.943	-0.851	-1.381	-1.046	-1.057	-0.705
Test 4						
Spanish logo Vs English logo (blue)	0.011	-0.107	-0.331	-0.365	0.696	0.670
Spanish logo Vs English logo (red)	1.444	0.993	1.447	1.126	1.871*	1.841*
Test 5						
Red logo IDB Vs blue logo IDB	-1.503	-1.169	-1.897*	-1.588	-1.273	-1.281
Test 6						
Blank logo Vs Mexican Univ.	0.590	0.452	0.313	0.412	1.018	1.325
Blank logo Vs Foreign Univ.	0.267	-0.227	-0.443	-0.255	0.444	0.853
Blank logo Vs Health Min.	1.952*	1.488	1.999**	2.079**	2.155**	2.459**
Blank logo Vs Env. Min.	2.916***	2.396**	3.414***	3.143***	3.182***	3.121***
Blank logo Vs. blue logo IDB	0.995	0.333	0.168	0.141	1.109	1.136
Blank logo Vs. red logo IDB	2.457**	1.457	2.02**	1.681*	2.317**	2.340**
Blank logo Vs. Spanish logo IDB	0.935	0.415	0.48	0.485	0.364	0.412

Note: t-value for tests for difference in means, two-tailed, unpaired; * significant at 10%; ** significant at 5%; *** significant at 1%.

contemporaneous and latent 5 in 10,000 mortality risk reduction measures but not significantly so for the contemporaneous 10 in 10,000 mortality risk reduction. The health history dummy variables were broadly non-significant, with only some evidence found for blood pressure affecting (increasing) WTP, but with the effect not being present in several of the cases.

The survey sponsor effect found in the previous section (t-tests of differences) for the Environment Ministry sponsorship is also found here in the regressions for the different sampling filters and risk reduction measures (i.e. the survey sponsor effect persists even when other explanatory factors are accounted for). The Environment Ministry sponsorship is associated with a reduced WTP value (at least at 5% significance in all cases except one, where it was significant at 10%). In addition, the Health Ministry sponsorship effect also results in significantly lower WTP (10% significance) for all but one of the cases considered. For the other survey sponsor types there was no consistent effect on WTP (most notably for the red logo IDB sponsorship, for which an effect had been found when comparing mean values in the previous section, but when controlling for other factors becomes generally non-significant)[37]. A measure of trust in institutions[38] was also used in interaction with the different survey sponsorship types to see whether stated trust in the Environment and Health ministries was associated with lower WTP, but no significant effect was found (results not reported here). This suggests that the survey sponsorship results are explained by other factors besides institutional trust.

Two of the ‘participant engagement’ measures were also included to see whether these have an effect on stated WTP: time spent on the first WTP question and time to complete the questionnaire[39]. Statistically significant effects are found only for the former: broadly speaking as time spent on the first WTP question increases the stated WTP for mortality risk reductions also increases, but as the participants progress through the different WTP questions in the questionnaire this effect first becomes less significant (second WTP question) and then essentially disappears (third, and last, WTP question). This is taken as suggesting evidence of respondent learning effects.

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[37] The ‘blank’ logo version of the survey was used as basis for these comparisons and thus was omitted from the regression.

[38] This data was collected for use in chapter 4, which considers whether there are statistically significant relationships between social capital (mainly trust in institutions) and WTP for the mortality risk reduction product.

[39] The other two measures considered before, completion rates and item response rates, are not included in the regression.

Significant negative effects are found for a few of the quality control questions included that check for understanding and acceptance of the scenarios set out in the survey: those that stated that they doubted the product would work as described; those that thought that their own risk of dying was higher than the baseline risk for the people of the same age and gender; and for those that thought that the product may deliver other benefits besides mortality risk reductions to themselves. The latter result is surprising as in previous studies, and in line with theory, people stating that there were additional benefits were willing to pay more than those who didn't.

The geographical dummies find some evidence of a positive effect on WTP for the State of Mexico (10% significance), but this effect weakens as respondents progress through the questionnaire and is no longer found once an answer is given to the last WTP (latent risk question).

The intercept (constant term) value is negative: the intercept value would generally be interpretable as WTP for mortality risk reductions should all the explanatory variable values be zero (which taking a negative value would indicate participants were not willing to pay any amount, if it is assumed that the truncation at zero is legitimate, or that they would be willing to take on additional mortality risks in exchange for increased income). Further analysis showed the negative intercept value is caused by the presence of the income variable in the regression: when income is removed from the equation the intercept is statistically not different from zero (i.e. the negative intercept is a projection to a non-existent state of zero household income from the average income value in the regression). As such the intercept was interpreted as having limited intrinsic meaning in the model.

4. Conclusions

This chapter describes the result of an experiment that involved varying the sponsor of a survey that asks individuals for their WTP for mortality risk reductions, and observing how this impacted participant engagement measures and WTP values. For most of the sponsorship types tested no statistical effect was found for these measures, with some meaningful exceptions.

Some evidence of lower participant engagement was found for the Environment Ministry and the blank logo version of the survey on survey completion rates but this seems to be somewhat counterbalanced by these types of survey logos being associated with having fewer questions left unanswered on average. Higher participant engagement was found for the Mexican university sponsorship in terms of the survey completion rate, but again this seems to be counterbalanced by more questions left unanswered. In some of the tests more respondents spent 'sufficient' time on the first WTP question for the blue logo IDB, Spanish language IDB and the Health Ministry than for the other logos. Given these trade-offs it is recommended that studies assessing participant engagement in the future should try to capture several dimensions of engagement rather than drawing conclusions from a single measure.

Most notably, a significant result was found for the WTP values for the two options that tested for an effect of a government ministry sponsorship (namely for an Environment Ministry sponsorship and for a Health Ministry sponsorship, with a stronger effect in the former case). The sponsorship effect was to reduce average WTP by between 22% and 25% in the case of the Environment Ministry, and by 13% and 17% in the case of the Health Ministry[40] (when compared to the average WTP of the other survey sponsor types).

To attempt to understand these results it is useful to first highlight some characteristics of the questionnaire that was employed. Firstly, the questionnaire states that the sponsor of the survey is not representing a private company, nor is it trying to sell a product. This has the aim of reducing strategic answering by the respondent, e.g. by stating an artificially low WTP to try to reduce the future offer price of the product (if it is made available in the market). Secondly the survey asks respondents for WTP for a product that can be purchased freely and consumed by the respondent herself to reduce her own baseline risk of dying. This is done to highlight to the respondent that the risk of dying can be reduced with low or no transaction costs, and that this is a fully private good.

Given these survey characteristics a possible interpretation for the lower WTP results found for the Environment and Health ministries is that government agencies are seen by the respondents as making a non-credible statement in the questionnaire that the survey sponsor is 'not trying to sell a product', as the intrinsic characteristics of the product could be seen to be aligned with the policy objectives of these two government ministries (i.e. mortality risk reductions). As such, the survey may not fully succeed in avoiding gaming by respondents to try to reduce future costs to themselves. In addition, the respondents may also not see the description of the good as a fully private good as credible when the survey is sponsored by government ministries. Public healthcare systems and environmental protection programmes are mechanisms for the socialisation of risks, and respondents may feel that public

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[40] Figures for the sample C comparisons of regression estimates. A table with the effects on average WTP of the Environment Ministry and Health Ministry sponsorship can be found in Annex 3.2.

Table 17 - Construct validity tests (regression)

	Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Age (years)	57.85 ***	21.02	50.58 **	20.69896	35.87	22.14258	32.70	23.36285	69.74 ***	22.40	68.96 ***	23.22527
Female (=1)	-254.19 *	129.83	-289.28 **	127.4895	-331.39 **	136.7187	-378.59 ***	143.8501	-258.11 *	138.43	-262.00 *	143.1499
Household pc income (MXN, log)	258.36 ***	42.97	250.52 ***	42.51775	280.70 ***	45.24103	254.27 ***	47.94283	182.69 ***	45.76	156.63 ***	47.681
Married (=1)	-128.72	131.16	-152.11	129.149	-124.98	138.089	-169.83	145.6853	-127.26	139.78	-125.81	144.9556
University education (=1)	-126.85	134.87	-11.52	132.7032	-6.34	142.0462	-13.30	149.7781	-126.44	143.79	-99.74	149.0387
Very religious (=1)	-577.07 ***	170.15	-476.63 ***	166.2865	-483.49 ***	179.1414	-421.26 **	187.4698	-915.24 ***	182.15	-832.23 ***	187.2306
Smoker (=1)	182.46	135.82	213.95	132.8972	254.94 *	142.9895	266.79 *	149.9408	232.35	144.74	268.31 *	149.2095
Own insurance (=1)	238.20	159.92	282.31 *	156.1491	443.09 ***	168.2653	491.47 ***	176.1341	321.13 *	170.51	358.93 **	175.3509
Heart disease (=1)	-159.04	387.82	-258.69	382.4969	-3.77	408.5082	-5.12	431.9591	-20.64	415.03	38.05	430.7939
Bronchitis (=1)	496.86	326.46	613.93 *	319.9173	549.64	344.1722	686.29 *	361.4018	250.69	349.41	402.00	361.0055
Asthma (=1)	-33.19	367.18	-225.61	361.3623	-64.42	387.1783	-159.28	408.1406	308.06	391.07	192.39	405.6991
High blood pressure (=1)	394.31 **	183.84	289.32	181.2156	386.33 **	193.4845	453.36 **	204.3949	52.74	195.87	72.85	203.2492
Cancer (=1)	61.79	524.64	210.56	503.3755	74.77	552.7335	-25.08	568.6919	411.60	556.36	354.77	562.5614
Hospital admission (=1)	80.04	317.83	128.14	313.7173	198.62	334.9196	288.91	354.3528	40.45	339.53	124.67	353.1882
Emergencies admission (=1)	8.85	300.87	64.31	297.7094	-116.45	317.3326	-142.12	336.3045	-191.70	321.42	-206.69	334.6322
Mexican university (=1)	-143.18	245.30	-79.82	243.0508	-95.70	258.4581	-67.18	274.3371	-220.26	261.76	-264.68	273.1598
Foreign university (=1)	53.76	253.76	173.17	250.9393	227.40	267.3077	192.21	283.2486	91.89	270.35	-8.75	281.5825
Environment Ministry (=1)	-656.60 **	254.97	-483.86 *	252.7862	-783.34 ***	268.5082	-719.93 **	285.1528	-681.63 **	271.84	-671.07 **	283.7817
Health Ministry (=1)	-482.02 *	248.66	-371.04	246.3952	-461.52 *	261.6361	-517.45 *	277.8375	-499.13 *	265.17	-603.16 **	276.752
Blue IDB (=1)	-247.93	249.00	-85.00	245.698	-47.21	262.088	-30.99	277.1955	-215.61	265.45	-210.23	275.9212
Red IDB (=1)	-514.82 **	255.77	-240.96	251.6192	-400.99	269.2076	-312.40	283.8631	-404.26	272.52	-404.11	282.4507
Spanish IDB (=1)	-184.71	257.88	-29.97	254.3152	-52.11	271.4178	-33.12	286.8433	-9.30	275.06	7.26	285.6373
Time on WTP5, 5 secs to 15 secs (=1)	989.56 **	481.67	1,024.37 **	502.68	553.87	502.97	434.04	561.53	307.61	508.12	473.47	558.12
Time on WTP5, 15 secs to 25 secs (=1)	336.06	448.89	270.57	470.49	-218.80	468.20	-348.40	524.72	-425.08	473.24	-306.15	521.85
Time on WTP5, 25 secs to 2 mins (=1)	1,085.49 **	428.68	1,176.89 ***	451.64	738.94 *	446.72	682.01	503.22	138.40	451.41	291.91	500.39
Time on WTP5, more than 2 mins (=1)	1,713.30 ***	527.31	1,831.58 ***	541.53	1,213.44 **	551.74	1280.83 **	605.98	705.54	556.74	990.44	601.54
Time to completition (mins)	8.77 *	4.67	6.39	4.65	5.36	4.91	2.95	5.24	2.55	4.98	0.95	5.22
Doubted product would work (=1)	-378.66 ***	139.36	-423.10 ***	137.2853	-491.82 ***	146.7346	-519.25 ***	154.9077	-564.45 ***	148.71	-576.06 ***	154.2898
Risk doesn't apply to them (=1)	63.27	140.96	28.10	138.675	-5.22	148.4132	3.88	156.441	214.15	150.07	241.73	155.4703
Didn't understand payment timing (=1)	-50.75	193.53	-134.94	192.4779	-5.06	203.8524	0.21	217.2629	116.20	206.25	110.51	216.1531
Didn't think about ability to pay (=1)	-216.51	189.48	-415.81 **	189.706	-346.29 *	199.5584	-338.46	213.8925	-327.43	201.82	-287.51	212.7438
Thought own risk of dying was higher (=1)	-1,019.39 ***	326.75	-1016.94 ***	316.8359	-1,149.47 ***	344.1638	-1200.79 ***	357.0325	-1,086.65 ***	348.21	-1108.95 ***	355.3322
Thought about other benefits (=1)	-638.20 ***	132.73	-716.96 ***	129.4625	-737.34 ***	139.7367	-817.33 ***	146.0463	-873.73 ***	141.75	-964.42 ***	145.6315
Thought there would be side effects (=1)	-59.27	146.73	-111.95	145.2288	-98.18	154.476	-83.34	163.8332	-182.71	156.51	-111.68	163.1203
Federal District (=1)	446.39	296.77	514.79 *	296.3137	418.17	312.6047	458.06	334.6145	281.63	316.09	301.63	332.726
Mexico State (=1)	640.22 **	324.34	601.69 *	322.4062	641.02 *	341.6997	610.12 *	364.1151	400.69	345.69	358.82	362.2578
Jalisco (=1)	236.76	312.70	268.14	311.561	240.48	329.3857	238.60	351.8388	90.79	333.07	101.03	349.8316
Nuevo León (=1)	339.91	337.37	496.16	336.5063	271.55	355.4139	336.79	380.0416	-32.51	359.81	58.94	378.2516
Puebla (=1)	423.51	558.31	447.54	543.8696	421.44	588.3722	571.00	613.2074	566.95	595.55	728.78	610.0013
Yucatan (=1)	-438.40	671.15	-219.50	636.4791	-292.40	706.86	-328.38	718.943	-493.55	711.15	-468.31	710.9678
Constant	-2,781.05 **	1,085.20	-2708.22 **	1078.282	-1,686.78	1142.601	-1196.98	1216.473	-1,891.80	1,155.47	-1623.19	1209.18
Number of observations	3,224		2,942		3,224		2,942		3,224		2,942	

Note: * significant at 10%; ** significant at 5%; *** significant at 1%.

authorities should take on part of the costs associated with the respondents' own mortality risk reductions.

Conversely, it is also possible that non-government ministry sponsor types are perceived as not being credible entities, in terms of holding an active interest in the type of product described, and as such WTP answers given may be inflated as they are seen to be of little practical consequence. So for example the universities could be perceived as having a predominantly theoretical interest in the WTP questions, and the international development bank to be too distant from the respondents in terms of decision making to be likely to affect them meaningfully. This would then make it more likely for behaviour such as presenting an ideal self to the surveyor to occur, which would increase WTP estimates.

In conclusion, the analysis showed that survey sponsor effects can exist in stated preference surveys. These sponsorship effects had not previously been identified in the literature. Sponsorship signalling may have previously undermined the efforts of surveyors to construct questionnaires that mitigate behavioural bias, especially as under ethical good practice guidelines it is a common requirement that the sponsorship of the survey is disclosed to participants. However, further research would be needed to better understand the nature and direction of these effects.

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Chapter 4
Social capital and willingness-to-pay: The association between trust in institutions and the value of a statistical life

This chapter considers the relationship between social capital and willingness to pay for mortality risk reductions in Mexico. As was mentioned in previous chapters, measures of willingness to pay for mortality risk reductions are used to calculate value of statistical life measures and these, in turn, are applied to cost-benefit analysis calculations or in legal proceedings (in some jurisdictions). Previous research on social capital has shown certain types of social capital to be associated with health and socio-economic outcomes of interest to policy-makers. Some of the literature has tried to go beyond simple association and to establish causal links between social capital and these outcomes directly, with varying success.

The main focus of the chapter is on the association between individuals' trust in their institutions and stated WTP, but several other measures of social capital are also considered. WTP values are used at an institutional level (generally by public bodies, such as the Environment or Health Ministries) to make resource allocation decisions, for example through legislation that impacts mortality risk in the population. This institutional context is generally taken as a given or not explicitly considered in the WTP literature. Many measures that may affect an individual's mortality risk are decided at a public administration level (that is at a level at which the single individual has at best very limited influence over those decisions). The use of WTP for mortality risk reductions without considering the relationship between the individual and the institution may cause a problem of endogeneity in those decisions: if trust in the institution influences WTP for the 'product' offered by the institution (in this case mortality risk reductions), then the institution can itself affect the determination of WTP[41]. If such relationships between trust in institutions and WTP exist these could also impact benefit transfer measures: it may not be appropriate to transfer values from high institutional trust contexts to low institutional trust contexts, and *vice versa*, without at least

[41] Even if unwittingly.

considering an adjustment for trust. The conceptual framework is one where individuals, that are in all respects statistically the same but for their stated trust in the different institutions, are asked to express their WTP for products that reduce their mortality risk[42]. Any differences that may be found between WTP values can then be associated with the different levels of trust in institutions. In practice, however, this association between trust in institutions and WTP for mortality risk reductions does not establish causality as there may be unobserved factors that cannot be, or have not been, controlled for that produce that association. The hypothesis to be tested then is then whether there is an observable and statistically significant association between trust in institutions and WTP for mortality risk reductions (or to the VSL), in which case further research on causality would be recommended: if it is found, for example, that in the presence of high levels of individual trust in institutions higher levels of WTP can also be expected to also occur this may motivate further research into the issue of the relationship between social capital and WTP (i.e., even if any such relationship may only be a channel for unobserved causes).

The analysis in this chapter finds that some measures of social capital, including trust in institutions measures, have statistically significant associations with the stated WTP measures considered, while other measures of social capital show no such association. The results also vary for different groups in society. The results do not support rejecting the hypothesis that there is an association between social capital and WTP. It is thus possible that the WTP measure may be to an extent endogenous to decisions made at an institutional level have an impact on trust, but more research is needed to investigate this issue further (namely to seek to establish whether causal relationships exist).

1. Background and literature review

Definition of social capital

Social capital theory developed from sociology and political science (Szreter & Woolcock, 2004; Rostila, 2011). The first theorists of social capital highlighted the importance of social connections in the achievement of individual or communal goals, and sought to offer a more formal descriptive definition and typology of social capital. The definition of social capital, and the usefulness of related concepts, continues to be a focus of debate within academia. Szreter & Woolcock (2004) see the concept of social capital as one of those contested concepts 'that are simply too politically and ideologically important for those at any point on the political spectrum to concede to a definition of

[42] Confounding effects of other types of social capital are accounted for in the analysis, to isolate the relationship between trust in institutions and WTP from other types of related measures of social capital (availability of support from friends, general trust in others, etc.)

the term that they do not see as squaring with their own beliefs, assumptions, and principles. Contested concepts reflect a consensus on the broad nature of the phenomenon they refer to and its great importance, without any agreed-upon closure on the terms of its definition'. As such, there are multiple definitions of social capital in the literature, which have varied with the emphasis that specific research fields or individual researchers seek to place on different aspects of the concept. The concept of social capital is now applied widely in several fields in the social sciences literature (as measured in an increasing number of references to 'social capital' in social sciences articles, Field, 2008) and has become a focus for public policy work (for example World Bank, 2015). Statistical offices in several countries collect data attempting to measure social capital (see OECD, 2015). For the purpose of this chapter the focus is on the definition of social capital as an economic concept and on the evidence of relationships between social capital, health outcomes and willingness-to-pay for mortality risk reductions.

The current concept of social capital originates in theoretical work done in the 1980s and 1990s, primarily by Pierre Bourdieu, James Coleman and Robert Putnam[43]. Definitions of social capital include:

'Social capital is the aggregate of the actual or potential resources which are linked to the possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition – or in other words, to membership of a group – which provides each of its members with the backing of the collectively-owned capital' (Bourdieu, 2011);

'Social capital is defined by its function. It is not a single entity but a variety of different entities, with two elements in common: they all consist of some aspect of social structures, and they facilitate certain actions of actors - whether persons or corporate actors - within the structure. Like other forms of capital, social capital is productive, making possible the achievement of certain ends that in its absence would not be possible. Like physical capital and human capital, social capital is not completely fungible but may be specific to certain activities. A given form of social capital that is valuable in facilitating certain actions may be useless or even harmful for others' (Coleman, 1988);

'By analogy with notions of physical capital and human capital - tools and training that enhance individual productivity - "social capital" refers to features of social organization such as networks,

[43] Some have pointed out that although the term social capital became established from the 1980s onwards, the ideas that form the basis of the social capital concept have a much longer academic history. These authors have also criticised a recent shift in the meaning of the concept from having primarily a focus on social theory (as in Bourdieu, 2011) to becoming more of an economic concept, especially as an additional production factor within a neo-classical economic perspective (Fine, 2008; Farr, 2004).

norms, and social trust that facilitate coordination and cooperation for mutual benefit.' (Putnam, 1995).

A synthetic definition of the meaning of social capital is that the type of relationships that exist in a society matter for the type of outcomes that that society produces (e.g., social links are resources that can be drawn from for the benefit of agents; Lin, 2002, 1999). From an economic perspective 'social capital' can be seen as a form of capital - as are physical capital or human capital -, as it requires an investment for it to be formed (in terms of time or other resources), it can depreciate, and it can to an extent be transmitted to others (for example through a job recommendation). Investment in social capital may lead to a positive return to the individual through multiple channels (increased job opportunities, a better education, more emotional support, etc.).

At an aggregate level (e.g., a society rather than at the level of its individual actors) the social capital literature concentrates on how joint measures of social capital affect social outcomes. From this perspective social capital can be seen as a collective resource from which a society produces value. Much of the literature concentrates on how different levels and types of social capital affect social outcomes across groups or individuals. Part of this literature uses aggregates of individually-measured social capital or per capita measures of aggregates (such as number of sports clubs or neighbourhood associations per capita) to make international, inter-regional, or inter-organisational comparisons between social capital and different outcome variables. Some examples of these are on the effect of social capital on economic growth (Durlauf & Fafchamps, 2005; Bjørnskov, 2012; Zak & Knack, 2001; Horváth, 2013; Beugelsdijk & van Schaik, 2005), innovation and entrepreneurship (Dakhli & De Clercq, 2004; Kim & Kang, 2014), firm-level productivity (Bloom, Sadun & Reenen, 2009) or crime (Buonanno, Montolio & Vanin, 2009; Corbacho, Philipp & Ruiz-Vega, 2015; Lederman, Loayza & Menendez, 2002). Other papers consider how other variables affect the levels of social capital, with a view to understanding how social capital is built or how it can deteriorate. For example how religiousness affects social capital (Berggren & Bjørnskov, 2011), how different teaching practices affect social capital (Algan, Cahuc & Shleifer, 2011), or how access to technology affects social capital (Bauernschuster, Falck & Woessmann, 2014; Olkean, 2009; Schmitt-Beck & Wolsing, 2010).

From the above it can be seen that causality is an important issue to consider in the social capital literature: is bad health leading to lower levels of social capital (for example by limiting the frequency of interactions with friends and family); or do low levels of social capital lead to bad health outcomes (for example by reducing access to informal information about healthcare availability that would come from friends and family)? The issue of causality is discussed below.

Another part of the literature focuses on how varying levels of social capital measured at the level of the individual person affect that person's outcomes in society. The existence of a frequent *associative* relationship between social capital and health outcomes is now established in the literature. There are several systematic reviews of the literature that find that this link is present for different types of health outcomes, different socio-economic groups, and different countries (Ehsan & De Silva, 2015; McPherson, Kerr & McGee, 2014; Silva & McKenzie, 2005; Murayama, Fujiwara & Kawachi, 2012; Uphoff, Pickett, Cabieses, *et al.*, 2013; Nyqvist & Forsman, 2013). However, this association is not always present, depending on the type of social capital measure that is used in the analysis, on cultural, historical or social context, or on the level of aggregation (e.g., communal or individual social capital).

Categories of social capital

There are also several attempts in the theory of social capital literature at classifying social capital into different types. The most frequent classification in the literature settles on three key concepts: bonding, bridging and linking social capital (Rostila, 2011). These distinctions are relevant as different types of social capital may have different statistical relationships with the variable of interest being investigated (or some might have no relationship whereas others do have one). The most common distinction in the literature is that between 'bonding' and 'bridging' social capital, described in Putnam (2001). Bonding social capital describes trust that is formed between people by the fact that they are similar to each other along relevant dimensions (for example people in the same family, close friends, the mafia, etc.). Bonding social capital tends to reinforce homogeneity within the group and to exclude those outside the group. Bridging social capital, in turn, describes trust that is formed between people despite the fact that they are different along social dimensions (for example, a sports club or another activity-based association that does not restrict access to membership may generate bridging social capital as it creates a space where people who wouldn't normally meet can socialise). Bridging social capital tends to reinforce broader trust across social groups (i.e., to be inclusive) and to lead to a positive valuation of social heterogeneity by individuals.

It should be noted that homogenising or heterogenising effects can be present within both bonding and bridging types of association, and so Putnam's classification is not strict. For example, it is possible that the values within a family orient an individual towards generalised trust and to bridging social capital-type effects, whereas her group of friends might have the opposite effect; or having a child may lead parents to interact with other adults they might otherwise not have, whilst also increasing within-family bonds. Also, being in groups with 'high' social capital is not necessarily beneficial for the individual – someone who is a member of the mafia might have been better off not belonging to that group (Portes, 2000). Keeping these issues in mind can help in the conceptualisation of the analysis and in the interpretation of analytical results in the literature (for example, are close relationships of trust with friends or family related to positive health outcomes for some socio-economic groups but to negative outcomes for others?).

A later addition to social capital theory that is particularly useful in the current analysis, as it introduces the concept of trust in institutions as a type of social capital, is the concept of 'linking' social capital (Szreter, 2000; Woolcock, 1998, 2001). Whereas bonding and bringing social capital are horizontal in nature, relating to the connections made between individuals with broadly similar power in society, linking social capital refers to 'vertical' relationships, between individuals and institutions at different levels or types of power in a society (for example, relationships between an individual and the state, the police, private companies, her political representatives, etc.). Linking social capital is of particular interest for health-related research as much of healthcare in many societies is on offer from public and private institutions, rather than from contacts between individuals (either from bonding or bridging social subgroups).

A further classification of social capital that guided the present research is offered by Scrivens and Smith (2013). The authors divide possible measurements of social capital into four main groups: 1) personal relationships; 2) social network support; 3) civic engagement; and 4) trust and cooperative norms. These four groups are described by the authors as follows:

1) *Personal relationships (socialising)* – 'the structure of people's networks (i.e. the people they know) and the social behaviours that contribute to establishing and maintaining those networks, such as spending time with others, or exchanging news by telephone or email';
2) *Social network support (support from others)* – 'a direct outcome of the nature of people's personal relationships, and refers to the resources – emotional, material, practical, financial, intellectual or professional - that are available to each individual through their personal social networks';
3) *Civic engagement* –'comprises the activities and networks through which people contribute to civic and community life, such as volunteering, political participation, group membership and different forms of community action';
4) *Trust and cooperative norms* – 'the trust, social norms and shared values that underpin societal functioning and enable mutually beneficial cooperation. The concept primarily refers to different kinds of trust, as well as norms of reciprocity and non-discrimination. The types of trust that are most often considered as forms of social capital are generalised trust

(i.e. trust in 'others', including strangers) and institutional trust, which can refer to political institutions as well as the judiciary, police, the media or other institutions'.

These classifications are useful in clarifying the different approaches and emphases in the social capital literature and in systematising the concept in a way that allows developing a view of what a comprehensive data collection exercise on social capital might look like. Types of variables that may be collected under each of the four classes are listed in the second column of table 18[44] (the implementation of these measures is discussed further in the methodology section – column 3 lists the questions that were asked to survey participants).

This chapter represents, as far as was possible to determine in the literature review, the first attempt at investigating the relationship between trust in institutions and willingness-to-pay. The hypothesis, which is tested in the analytical section below, is that measures of trust in institutions and WTP for mortality risk reductions show an association. Also of interest is, should a relationship exist, what type of social capital is statistically related to WTP and how significant is the effect.

Association between social capital and health

There is now an extensive empirical literature on the association between social capital and health. There are studies in the literature on social capital and health that include, at least implicitly, each of the four categories of social capital introduced by Scrivens & Smith (2013). Some of these studies consider several measures of social capital simultaneously, seeking to assess whether different categories of social capital are associated with different health outcomes. Findings from some studies indicate that different cultures and social norms may affect the association between social capital and health. Kim, Subramanian, & Kawachi (2006) report a significant negative relationship between several measures of bonding and bridging social capital and self-reported fair and poor health status in the U.S.A. Using a similar instrument, Iwase et al. (2012) find that high bridging social capital is associated with positive self-reported health in Japan. However, contrary to the U.S.A. case, for bonding social capital such an effect is not consistently found in the Japanese study. Further, several multi-country studies exist that again consistently find patterns of association between various social capital measures and different health outcomes. However, these patterns are significantly more likely to be similar for groups of countries that are similar between themselves,

[44] There may be an overlap in these classifications which may make interpretation harder. For example an individual's participation in a civil society organisation is a common indicator of her civic engagement, but may also, or even primarily, be an indicator of her 'personal relationships' social capital (e.g., some people may join organisations not for civic purposes but to socialise, even if that is not the stated aim of the organisation). The specific wording of the question or the use of follow-up questions may help clarify some of these conceptual overlaps.

along relevant socio-economic, cultural or historical dimensions (OECD, 2010; Mansyur, Amick, Harrist, *et al.*, 2008). As such, social capital literature results are expected to be country-specific or at most specific to groups of countries.

In the Mexican context, Bojorquez-Chapela et al. (2012) use a longitudinal dataset to assess the effects of social capital on symptoms of depression amongst the elderly across several localities in the country in an 11 month timeframe. The authors collected several measures of social capital that they turn into a single locality-level index through averaging. Two consequences of this double aggregation process (of social capital measures and of individual results) are that the possible varying effects of different types of social capital cannot be discerned and individual-level characteristics are averaged out to form the index. Still, the authors report that there is a positive association between their locality-level social capital index and lower depression symptoms for women (but not for men).

Sapag & Kawachi (2010) use three social capital indicators from the 1997 World Values Survey to analyse the relationship between social capital and health outcomes (including self-reported health, country-level life expectancy at birth and mortality rates) in nine Latin American countries. The three social capital measures used were trust in others, membership of voluntary organisations, and church attendance. For Mexico only church attendance was significantly associated with self-rated health outcomes (the association was found to be negative). The authors list several conditioning factors to the study and caution that further work is needed to settle and interpret their results.

Some associational studies offer indications for the generation of hypothesis and the data analysis. Hamui-Sutton et al. (2009) consider the link between poverty, social capital and acute respiratory disease within the respondent’s family, using data collected through a survey conducted in rural health clinics in Mexico. The social capital measures used in the study relate to social support networks (moral support received from family, friends, employer, and government when a case of acute respiratory illness occurs; and what is the source of information on healthcare for the respondent). The authors find that associations between the social capital measures and the healthcare outcome vary between income groups, indicating that income distribution is a relevant dimension to consider: for poorer families incidences of acute respiratory illness are associated with higher moral support from close family, but lower support from other family members, friends, employers and government than for richer families.

Table 18 – Types of social capital, types of variable per type of social capital, and questions used in the survey to capture each type of social capital

(1) Types of social capital	(2) Variable types	(3) Questions used
Personal relationships	Social contact with friends, relatives or colleagues (frequency, importance given, mode of contact, size of groups, extent of diversity in the groups, trust); time spent alone (frequency, lenght, feelings felt); attitudes towards people in the local area (feelings felt; attitudes to ethnic diversity); informal, unpaid care and support to others; participation in associational activities; effect of religious views on personal life.	How often do you spend time … a) with friends; b) socialising with work colleagues outside work; c) socialising with your neighbours. Options: never; a few times a year; once or twice a month; almost every week.
Social network support	Support from others, received and perceived to be available (type - advice, emotional, financial, childcare, medical, etc; source - family, friends, neighbours, public administration, civil society groups, etc; extent available); support provided to others (type; to whom; frequency; amount).	Do you believe that if you needed to ask someone ...… how difficult would it be? a) … to lend you a month's wages ...; b)… to help you with an illness ...; c) ... to help you to find a job … ; d) … to accompany you to a doctor …; e) … with help with improvements to your block or neighbourhood ... Options: Impossible; difficult; neither easy nor difficult; easy.
Civic engagement	Interest in politics, active participation in the political process, and voting habits; perception of ability to influence political decisions; participation in civil society organisations (active/non-active member; financial and/or time commitment); participation in religious organisations and activities; volunteering; engagement in local community;	(1) Are you a member of a civil society or religious organisation? a) sports club; b) political party or organisation; c) NGO; d) cultural or social club; e) church, parish, or religious group; f) neighbourhood association; g) educational association (parents group, alumni group, etc). Options: active member; non-active member; used to be a member; was never a member. (2) Did you do any volunteering in the past year? Options: yes; no.
Trust and cooperative norms	Generalised trust in others; perceived fairness and helpfulness of others; personal experience of corruption, dishonesty or discrimination; trust in institutions, professional and social groups; attitudes towards social institutions and the functioning of the economy; voting patterns; interest in politics; tolerance (ethnicity, gender, sexual orientation, immigration and immigrants, etc); views on social norms (compliance with the law, tax evasion behaviour, expectations of altruistic behaviour in others, reciprocity, degree of conservativism); perception of safety; feelings of belonging.	(1) How much do you trust the following institutions? a) the church; b) humanitarian NGOs; c) environmental NGOs; Mexican universities; d) U.S.A. universities; e) the Environment Ministry; f) the Health Ministry; g) the press; h) the Federal Government; i) political parties; j) large companies; k) the police; l) the judicial system. (2) Generally speaking, would you say that most people can be trusted, or that you can’t be too careful in dealing with people? Options: most people can be trusted; you can't be too careful in dealing with people.

Source: adapted from OECD (2015) and Scrivens & Smith (2013). ‘Questions used’ describes the questions used in the survey.

Finally, some of the social capital and health literature has explored the consequences of observed historical shifts in the nature of social capital, with a view to understanding what impact these longer-term changes might have on health. This literature falls into a broader community health effects literature, in which health outcomes are described as resulting in part on social context, not only individual-level characteristics[45]. The main theoretical proposition in regards to long term shifts in social capital was derived from the observation that there is an historical reduction in stated trust in other people and in institutions, while there is a growth in membership in single-issue organisations where increasingly dominant individualism finds compatibility with belonging to a group (Fukuyama, 1999). This decline in generalised trust in combination with high levels of civic engagement has been termed 'miniaturisation of community', in reference to a reduction of trust in others to a narrower range of people. From this starting point (of the combination of civic engagement and generalised trust that defines the miniaturisation of community) three other types of social capital are possible to describe (Lindström, 2004): those with high social capital (high engagement-high trust); those with low social capital (low engagement-low trust); and a 'traditionalist' group (low engagement-high trust), a term which refers to a previous societal state where social participation was predominantly low in terms of membership in civil society organisations (single-issue or otherwise), but there were higher levels of trust in other people.

Table 19 – Social capital types for analytical breakdown

	Low Generalised Trust	**High Generalised Trust**
Low Civic Engagement	Low social capital	Traditionalists
High Civic Engagement	'Miniaturisation of community'	High social capital

[45] Finding, for example, that increased economic inequality is associated with worse health outcomes (Mansyur et al., 2008; Uphoff et al., 2013; Islam et al., 2006; Folland et al., 2012).

In practical terms, this research has found that the civic engagement/generalised trust categorisation can highlight significant differences in health outcomes within the same society. For example, Ali, Merlo, Rosvall, Lithman, & Lindström (2006) show that different types of social capital can be combined to reveal different associations between social capital and health outcomes within subgroups in society. They first find a link between low civic engagement and acute myocardial infarction, but no evidence of such a link for generalised trust and acute myocardial infarction. They then break down the data into the four social groups described above for further analysis. The authors find a significant association between trust and acute myocardial infarction for individuals with a traditionalist community involvement, but not for the other three subgroups. Significant differences for social capital subgroups were also reported in relation to self-reported health and psychological health (Lindström, 2004; Nummela et al., 2008) and drug use (Johnell et al., 2006).

Causality and association

A significant issue that is still a challenge in social capital and health research is the difficulty in establishing causality. Most studies are 'associational' studies, which seek to find correlations between the two measures without extricating cause and effect. Several, more recent, studies have tried to establish causality through specific study designs and econometric techniques. The issue of causality is complicated by the likely existence of reverse causality between social capital and health-related behaviours and outcomes (such as WTP for mortality risk reductions and other healthcare costs), and of common unobservable explanatory factors (Giordano & Lindström, 2016). On the whole, evidence is emerging that when a relationship exists it is social capital that tends to be a determinant of health outcomes (OECD, 2010; Mouw, 2006), but the specific processes by which this effect takes place are still being understood: the field is still accumulating evidence on establishing at least probabilistic causality and on how the links between the two elements are formed. Causality can be established through the appropriate use of instrumental variables, for cross-sectional data (Angrist & Pischke, 2008). This is the most common method by which authors have tried to establish causality between social capital and health outcomes. Mouw (2006) points out however the difficulty of finding appropriate instruments for social capital: he finds only two studies in his literature review of the effects of social capital on employment outcomes that he deems make a convincing use of the instrumental variables technique. In general, there are weak theoretical foundations in most of the social capital literature supporting claims of causality when instrumental variables have been used (Shalizi & Thomas, 2011). Theoretical support for the independence of the instruments from the error term is one of the requirements for a valid instrument. A strong theoretical basis for independence of the instrument from the error term is required as actual independence is unverifiable (the relationship being unobservable). This is specifically a significant problem for the social capital literature as there are potentially many unobservable factors, and factors that are difficult to capture appropriately, that affect both social capital levels as well as most of the outcomes that social capital researchers want to investigate[46].

Longitudinal or panel data studies are a useful alternative to cross-sectional studies as they can factor-out time-invariant unobservable information. However, there are limitations to this approach, namely that the validity of differencing rests on making a theoretical case that unobservable variables are indeed time-invariant. Also, several social capital measures may, by definition, be generally time-invariant themselves[47], at least in relatively short periods of time, thus making differencing approaches problematic in terms of finding a statistical signal. This may help explain the results obtained in a meta-analysis of panel data studies by Choi, Mesa-Frias, & Nüesch (2014), which considers the effect of different measures of social capital on different health outcomes, and finds little support for a causal link (with the exception of measures of social support network and personal relationships, but then only for a limited number of cases)[48]. In addition, turning to monetised stated preferences, as WTP measures are rarely collected in longitudinal studies that also include social capital measures, it is unlikely that serendipitous exogenous shocks to social capital can be used for establishing causality.

Still, evidence of correlation between variables can suggest the presence of causal relationships and be a means to motivate further research, which can be particularly useful where no previous research has been conducted, is difficult to conduct for technical or data availability reasons, or raises ethical concerns. In a strict logical sense (i.e. regardless of the underlying data) the existence of correlation between two variables makes it more probable that a causal relationship exists between them than the absence of correlation, even as the existence of correlation does not prove causality[49].

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[46] For example homophily – tending to choose people as friends that are like us. What then leads to the outcome of interest? The interaction with friends or the shared views that motivated the friendship in the first place?

[47] That is, if one accepts social capital to be similar to other forms of capital (in particular human capital), then the effect of time is to appreciate or depreciate baseline social capital by some rate of change – differencing would capture the rate of change between periods only.

[48] Although the authors note that the meta-analysis was hampered by a lack of consistency in the way social capital was measured across the various studies considered.

[49] Stating all correlations as meaningless for the purposes of causality can be described as the 'dismissing correlation fallacy'.

Trust in institutions and health

While most of the literature on social capital and health (health outcomes or demand for healthcare) has focused on bonding and bridging measures of social capital, there has also been some research on the relationship between health and linking social capital, mainly in the form of trust in institutions or in professional groups (for example trust in medical doctors in general, as distinguished from trust in the person's personal doctors, acknowledging these may be related). Calnan & Rowe (2004) report that historical evidence in the U.K. and the U.S.A. shows that trust in individuals doctors has remained high, even as trust in doctors as a whole and in medical institutions has decreased (in line with trust in other institutions in society).

The literature on linking social capital and health has been based on the premise that increased levels of trust in institutions or in healthcare professionals makes it more likely that individuals would seek out medical treatment, follow treatment correctly, consent to other medical interventions, or feel that they have a more positive healthcare experience when making use of the services. These studies are however associational rather than causal in nature (in line with the other areas of social capital and health research mentioned above).

There is evidence of positive associations between trust in institutions and health outcomes. Mohseni & Lindstrom (2007), using Swedish survey data, find a significant statistical relationship between respondent's trust in the healthcare system and self-reported health status (controlling for other factors). They suggest that this may be due to individuals with low institutional trust in the Swedish healthcare system being less likely to seek out medical assistance, but that this would need to be investigated further (as it is a causal statement). A meta-analysis by Gilbert *et al*. (2013) finds strong positive associations between several measures of social capital and health outcomes, but bonding and bridging social capital show a stronger association than linking social capital (such as trust in institutions measures).

2. Methodology

The data were collected as part of the survey sponsorship data collection exercise used in the previous chapter. The social capital questions were placed at the end of the survey to avoid affecting the WTP measures unduly when compared to the standard questionnaire (respondents could not go back in the questionnaire to change stated WTP). However, due to resource constraints it was not possible to test a split design reversing the WTP and social capital question order to see if this had an effect on the results. The types of social capital considered (personal relationships; social network support; civic engagement; and trust and cooperative norms) were measured over several dimensions (i.e. using several variables and options). Although the main focus is on trust in institutions, the inclusion of other measures of social capital can mitigate eventual biases introduced by measurement error (Kim, Subramanian & Kawachi, 2006, 2008) and may offer some analytical insights themselves. The questions included in the questionnaire were chosen to match the four social capital categories defined by Scrivens & Smith (2013) – see column 3 in table 18.

Motivated by the literature review the analysis is performed on three subsets of data. Different subgroups in society may display different relationships of institutional trust, or other measures of social capital, and health-related outcomes (Gilbert, Quinn, *et al.*, 2013; Islam, Merlo, Kawachi, *et al.*, 2006):

a) Full regression;
b) Low income group versus high income group;
c) By type of social capital combination (of civic engagement and generalised trust; four types).

The full regression analysis uses the aggregate dataset with the objective of identifying significant associations between social capital and WTP for mortality risk reductions. As in the previous chapters the regressions are based on a Tobit model (see chapter 2).

The low income group versus high income group comparison is done between those with the lowest 20% income to those with the highest 20% income. The purpose of this analysis is to see whether different income groups in the sample reveal different types of associations between social capital and WTP for mortality risk reductions, in line with the findings in Hamui-Sutton et al. (2009).

Finally, the analysis by type of social capital (combinations of civic engagement[50] and generalised trust) compares results for the four groups defined previously [51]. The regressions dropped insignificant variables sequentially using Stata's `stepwise` command (keeping variables significant at least at the 10% level).

[50] Defined as individuals who are members of at least one civic society organisation.

[51] High social capital – generally trust other people and are members (active or not) of a civic group; low social capital – generally distrusts others and are not a member of a civic group; traditionalists – generally trust others and are not members of civic groups; and 'miniaturisation of community' individuals – generally distrust others and are members of a civic group.

3. Data

Multicollinearity

It is possible that the different social capital variables could be highly correlated with each other. This could be an indication that certain groups of variables may be measuring similar effects. For example, on average people who have a high level of trust in environmental NGOs may also have a high level of trust in humanitarian NGOs, expressing more simply a high level of trust in NGOs in general. But these individuals may also on average express high levels of trust in other non-governmental entities besides NGOs perceived to pursue socially desirable goals, such as universities. To synthesise any such information efficiently, and to avoid simply dropping highly correlated variables that may affect regression outcomes from the analysis, the variables that are found to be highly correlated were subjected to a principal component analysis (PCA).

PCA is a statistical technique that, in essence, finds a reorientation of the data whereby the number of dimensions for variables containing similar information can be reduced. That is, PCA summarises information in the original variables into a smaller number of variables, the ‘principal components’, while minimising information loss. The PCA method is most useful when the different original variables are thought to be capturing similar information (i.e. variables are highly correlated), as otherwise useful information may be lost in the synthetisation process. As such, the data are firstly inspected for high levels of correlation (see table 47 in Annex 4.1). The variables with a correlation coefficient above 0.5 or below -0.5 are considered to be ‘highly correlated’ for this purpose. This initial analysis revealed that only some of the institutional trust variables could be considered to be highly correlated. The ten variables that were correlated were synthesised into four new institutional trust variables:

- Government Ministries (trust in the Environment Ministry and the Health Ministry);
- NGOs (trust in environmental NGOs[52] and humanitarian NGOs);
- Politics, law and order (trust in political parties, the Federal Government, the police, and the law courts);
- Universities (trust in Mexican universities and U.S.A. universities).

[52] Trust in environmental NGOs also correlated highly with trust in the Environment Ministry but these two variables were not grouped together in the PCA, for simplicity in interpretation. Environmental NGOs were grouped with humanitarian NGOs only. Post-PCA analysis showed that the high correlation did not persist for trust in aggregate government ministries in relation to trust in environmental NGOs.

The remaining institutional trust variables (the press, large companies, and the church) were found not to correlate highly with any of the other variables and as such are included in the regressions separately.

As the variables are ordinal it is advisable to use categorical PCA rather than transforming the categorical variables into dummy variables or attempting to use the standard PCA analysis used for continuous variables (Kolenikov & Angeles , 2009; Olsson, 1979)[53].

Table 20 – PCA for institutional trust variables

Government Ministries	k	Eigenvalues	Proportion explanation	Cum. explained
	1	1.81	0.91	0.91
	2	0.19	0.09	1.00
NGOs	k	Eigenvalues	Proportion explanation	Cum. explained
	1	1.79	0.89	0.89
	2	0.21	0.11	1.00
Political parties, the police, law courts, and the Federal Government	k	Eigenvalues	Proportion	Cum. explained
	1	3.27	0.82	0.82
	2	0.44	0.11	0.93
	3	0.16	0.04	0.97
	4	0.14	0.03	1.00
Universities	k	Eigenvalues	Proportion	Cum. explained
	1	1.77	0.88	0.88
	2	0.23	0.12	1.00

The standard criteria for selecting principal components to keep for analysis is to take those with eigenvalues in excess of 1. From table 20 it can be seen that each of the aggregate institutional trust variables can be summarised by a single principal component, which reduces the original ten variables with high correlation to the corresponding four new institutional trust variables.

[53] The categorical PCA is performed using the `polychoricpca` command in Stata. This makes use of the polychoric correlation matrix, a procedure for constructing a correlation matrix that is based on a transformation of categorical data into (latent) continuous data (Angeles & Kolenikov, 2004).

Descriptive statistics

As set out in the methodology section, the analysis is based on a division of the data into three subsets:

a) Full regression;
b) Low income group versus high income group;
c) By type of social capital combination (of civic engagement and generalised trust – 'miniaturisation of community', traditionalist, etc.).

Basic descriptive statistics for each of these subsets are shows in table 21[54] (the full descriptive statistics can be found in Annex 4.2). As expected, high income individuals in the sample (top 20% household income per family member) are willing to pay more for mortality risk reductions than low income individuals. (the bottom 20%). The most noticeable differences between these two groups are on the socio-economic variables, with high income individuals significantly less likely to be female (44% versus 55% females in the low income group), more highly educated (83% have a university education, versus 46%), and more likely to have purchased a private own health insurance policy (41% versus 10%). High income individuals are more likely to socialise outside their families and to find it easier to receive help from others when in need. They are also more likely to be members of sports clubs, NGOs, and cultural or social clubs, but have similar likelihoods to poorer individuals of belonging to political parties and religious organisations. Higher income individuals have higher institutional trust in NGOs, universities and large companies, while low income individuals have slightly higher trust in the Health and Environment Ministries, the Federal Government, political parties, courts and the police. Low income individuals are more likely to be generally trusting of others than high income individuals.

'Miniaturisation of community' and high social capital individuals tend to have higher incomes and higher willingness-to-pay values than traditionalist and low social capital individuals. They are also more likely to have a university education and to have their own health insurance policies. Traditionalists are less likely to socialise outside their families than the other groups, with 'miniaturisation of community' individuals most likely to do so. Similar patterns emerge also for the 'support from others' variables, with traditionalists least likely to be able to find help easily and 'miniaturisation of community' individuals most likely to be able to. 'Miniaturisation of community' and high social capital individuals are more likely to have volunteered in the preceding year than

[54] The descriptive statistics shown are for subsample C only (subsample A descriptive statistics provided similar results).

traditionalists and low social capital individuals[55]. As for the trust variables, 'miniaturisation of community' individuals are more likely to have high trust in institutions, even as they have low levels of trust in other people (by definition). Traditionalists generally have the lowest levels of trust in institutions, even as they report high levels of trust in other people. This contrast between trust in institutions and trust in other people is less pronounced but also present for low social capital and high social capital individuals.

4. Analytical results

As the analysis considers associations between social capital measures (i.e. not causal relationships) statistical significant relationships between WTP and social capital are taken to be meaningful only as an indication of an area that may merit further research to explore issues of causality. Also, taking advantage of the format of the questionnaire, which includes three WTP questions in succession[56], and assuming that there may be learning effects for the different social capital groups that were defined, the analysis seeks to find statistically significant relationships that persist throughout the three WTP questions or that become more significant towards the third WTP question. There is no specific theoretical expectation in terms of the sign of the relationship: while some research on social capital and health outcomes and the demand for healthcare has found positive associations, other research has found no significant association. Finally, some forms of social capital may relate negatively to social outcomes (for example as has been described in the literature on the relationships of trust within some types of organised crime).

As was explained before, the main relationship of interest in this chapter is the one between trust in institutions and WTP, given that the relationship between individuals and the supply of healthcare is often, at least at some level, between that individual and an institution (say the national healthcare system). If institutional trust affects WTP in some way and the institution has a measure of control over how trustworthy they are perceived to be, then a possible endogeneity problem arises when using WTP values to support allocative decisions by the institution. As such the relationship between trust in the government ministries variable (Health and Environment, previously reoriented through

[55] The membership in civic society associations variables are used in the definition of the social capital types and so have no intrinsic meaning here.

[56] First, WTP for a reduction in contemporaneous mortality risk (in the next 10 years starting in the present time) of 5 in 10,000; second, WTP for a reduction in contemporaneous mortality risk of 10 in 10,000; and third, WTP for a reduction in latent mortality risk (when aged 70 to 80 years old) of 5 in 10,000.

Table 21 – Descriptive statistics: willingness-to-pay, socio-economic, and health

	Full regression		Low income		High income		Miniaturised community		Traditionalists		Low social capita		High social capital	
	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.
WTP for mortality risk reduction														
Contemporaneous 5 in 10,000	2,341	3,246	1,785	2,847	3,078	3,869	2,424	3,163	2,091	2,984	2,241	3,205	2,563	3,490
Contemporaneous 10 in 10,000	2,965	3,724	2,419	3,486	3,758	4,261	3,186	3,813	2,589	3,335	2,906	3,750	3,179	3,909
Latent (aged 70 to 80) 5 in 10,000	2,591	3,546	2,246	3,464	3,052	3,895	2,817	3,582	2,322	3,222	2,522	3,474	2,787	3,822
Age (years)	44.02	2.96	43.94	2.96	44.02	2.92	44.27	2.97	43.86	2.96	44.22	2.98	43.92	2.96
Female (=1)	0.49	0.50	0.55	0.50	0.44	0.50	0.48	0.50	0.53	0.50	0.52	0.50	0.46	0.50
Household pc income (MXN)	69,216	101,050	3,048	1,734	227,646	137,755	77,791	111,225	55,460	85,412	67,383	96,051	77,907	112,355
Married (=1)	0.60	0.49	0.59	0.49	0.60	0.49	0.59	0.49	0.57	0.50	0.60	0.49	0.63	0.48
University education (=1)	0.62	0.49	0.46	0.50	0.83	0.38	0.70	0.46	0.54	0.50	0.56	0.50	0.67	0.47
Very religious (=1)	0.17	0.37	0.15	0.36	0.21	0.40	0.17	0.37	0.17	0.38	0.19	0.39	0.15	0.36
Smoker (=1)	0.32	0.47	0.34	0.47	0.30	0.46	0.29	0.46	0.32	0.47	0.35	0.48	0.29	0.46
Own insurance (=1)	0.21	0.41	0.10	0.30	0.41	0.49	0.31	0.46	0.14	0.35	0.19	0.39	0.23	0.42
Heart disease (=1)	0.03	0.17	0.04	0.19	0.03	0.16	0.03	0.17	0.03	0.16	0.04	0.19	0.03	0.17
Bronchitis (=1)	0.04	0.20	0.04	0.20	0.02	0.14	0.04	0.21	0.04	0.20	0.02	0.14	0.05	0.21
Asthma (=1)	0.03	0.18	0.03	0.17	0.05	0.22	0.04	0.20	0.04	0.19	0.03	0.18	0.03	0.18
High blood pressure (=1)	0.14	0.35	0.15	0.36	0.13	0.33	0.14	0.35	0.15	0.36	0.13	0.34	0.13	0.34
Cancer (=1)	0.02	0.13	0.03	0.16	0.01	0.09	0.02	0.14	0.01	0.12	0.02	0.13	0.02	0.13
Hospital admission (=1)	0.05	0.21	0.06	0.24	0.05	0.21	0.05	0.22	0.03	0.17	0.04	0.20	0.07	0.26
Emergencies admission (=1)	0.06	0.23	0.07	0.25	0.05	0.23	0.06	0.24	0.05	0.21	0.05	0.22	0.07	0.26
Number of observations	2,814		648		595		578		892		473		871	

PCA) is of particular interest. In any case, the relationship of WTP to other social capital measures (other institutional trust variables, socialising, support from others, civic engagement, and generalised trust) is also considered briefly as it may offer some further insights. Table 22 shows the regression results for the trust variables for the different subsets of data considered (full regression results can be found in Annex 4.3).

In a first instance, using the strictest sense of the evaluation rule (statistically significant effects that are present in the regressions for all three WTP questions) there is not enough evidence to support general statistically significant associations between trust in institutions and WTP for mortality risk reductions in the sample. The strongest statistical relationships, at 1% significance, occur for trust in large companies for the low income group and in the press for the 'miniaturisation of community' group, both of which in the first WTP question (WTP for a contemporaneous mortality risk reduction of 5 in 10,000). The effect for the low income group does not persist in the second and third WTP questions. For the 'miniaturisation of community' group the second WTP also has a significant coefficient on the press variable, at 5% (i.e. the effect is present for the contemporaneous risk reduction questions only), but does not persist in the third WTP question. Confidence in the press in the 'miniaturisation of community' group has the largest single relationship with WTP, being associated with a WTP that is 22% to 34% higher for those who have some or much confidence in the press than for those who have little or no confidence.

Increased trust in the government ministries has a statistically significant negative association in the full regression for the latent risk question only (associated with a 122 MXN lower WTP, about 5% of the full WTP). In the social capital groups subsamples the trust in the government ministries variable is associated with lower WTP for the traditionalist group, but with higher WTP for the low social capital group. The effect is greater in absolute terms for the low social capital group. These groups are distinguished by the generalised trust variable: traditionalists tend to be generally trusting of others, whereas low social capital individuals tend not to be. The results suggest there may be a degree of substitution of generalised trust for trust in the government ministries in relation to demand for healthcare.

The variables that are statistically significant are generally not the same in each of the different social capital groups considered. This indicates that the nature of the relationship between the people in these different groups and their trust in institutions varies significantly and lends support to the idea that social capital research should consider social subgroups. Also, a variable may have a positive coefficient for one social capital group but a negative one for another. For example trust in the church has a positive relationship with WTP for the low income group, but a negative relationship for the 'miniaturisation of community' group. The generalised trust variable is not significant in the regressions (included only in the first three regressions as it is used to define the four social capital types).

The 'socialisation' measure of social capital shows the most consistent results for 'socialising with co-workers', positive and significant at the 5% level in the full regression for the contemporaneous and latent 5 in 10,000 risk reduction (but not for the contemporaneous 10 in 10,000 risk reduction). In the social capital types breakdown socialising with co-workers has a positive association at least at the 10% level for the traditionalist and for the low social capital groups (except for the latent risk reduction WTP for the low social capital group).

Table 22 - Regression results for the trust variables ('trust in Institutions' and 'generalised trust')

	Full regression			High income			Low income		
	cont. WTP 5	cont. WTP 10	latent WTP 5	cont. WTP 5	cont. WTP 10	latent WTP 5	cont. WTP 5	cont. WTP 10	latent WTP 5
4 Trust in institutions									
Universities (=1)				-292.6 *					
Political parties, the police, law courts, and the Federal Government (=1)							191.0 **		
NGOs (=1)		-160.2 **							
Government Ministries (=1)			-121.9 **						
The Press (=1)									
Large companies (=1)							484.0 ***		
The Church (=1)	-325.6 **							664.9 **	576.4 *
Generalised trust (=1)									

	Miniaturised community			Traditionalists		
	cont. WTP 5	cont. WTP 10	latent WTP 5	cont. WTP 5	cont. WTP 10	latent WTP 5
4 Trust in institutions						
Universities (=1)					-236.8 **	
Political parties, the police, law courts, and the Federal Government (=1)	227.5 **					
NGOs (=1)			-231.4 *		-235.8 **	
Government Ministries (=1)				-224.9 **		-218.9 **
The Press (=1)	824.6 ***	706.1 **				
Large companies (=1)						
The Church (=1)	-535.6 *					

	Low social capital			High social capital		
	cont. WTP 5	cont. WTP 10	latent WTP 5	cont. WTP 5	cont. WTP 10	latent WTP 5
4 Trust in institutions						
Universities (=1)						
Political parties, the police, law courts, and the Federal Government (=1)	-237.2 **	-248.2 *				-224.9 **
NGOs (=1)						
Government Ministries (=1)	345.4 **	348.2 **				
The Press (=1)						
Large companies (=1)						
The Church (=1)						

Note: *** 1% significance; ** 5% significance; * 10% significance. Sample C results. Generalised trust is used in the definition of the last four categories and so is not reported.

Table 23 - Regression results for the 'socialisation' and 'support from others' variables

	Full regression			Low income			High income		
	cont. WTP 5	cont. WTP 10	latent WTP 5	cont. WTP 5	cont. WTP 10	latent WTP 5	cont. WTP 5	cont. WTP 10	latent WTP 5
1 Socialisation									
Socialising with friends (=1)							726.6 **		
Socialising with co-workers (=1)	310.7 **		338.7 **						
Socialising with neighbours (=1)		325.4 *							
2 Support from others									
Borrow month's wage (=1)						-530.2 *			
Help with illness (=1)				-446.6 *					
Help find a job (=1)				435.1 *					
Help to go to visit a doctor (=1)		314.1 **	540.5 **	760.8 **	750.3 **	821.8 **			
Help to improve neighbourhood (=1)									

	Miniaturised community			Traditionalists		
	cont. WTP 5	cont. WTP 10	latent WTP 5	cont. WTP 5	cont. WTP 10	latent WTP 5
1 Socialisation						
Socialising with friends (=1)		813.9 **				
Socialising with co-workers (=1)				440.1 *	415.7 *	458.8 *
Socialising with neighbours (=1)						
2 Support from others						
Borrow month's wage (=1)			788.6 **			
Help with illness (=1)						
Help find a job (=1)						
Help to go to visit a doctor (=1)	1,254.0 **	1,312.7 **	1,094.6 *	523.1 *	635.5 **	806.0 **
Help to improve neighbourhood (=1)	465.9 *	706.8 **				

	Low social capital			High social capital		
	cont. WTP 5	cont. WTP 10	latent WTP 5	cont. WTP 5	cont. WTP 10	latent WTP 5
1 Socialisation						
Socialising with friends (=1)						
Socialising with co-workers (=1)	691.2 **	644.1 *				
Socialising with neighbours (=1)						
2 Support from others						
Borrow month's wage (=1)						
Help with illness (=1)				-555.3 **	-586.1 **	
Help find a job (=1)				512.6 *	657.0 **	
Help to go to visit a doctor (=1)						
Help to improve neighbourhood (=1)						

Note: *** 1% significance; ** 5% significance; * 10% significance. Sample C results.

In the 'support from others' questions, the ability to count on support to accompany the respondent to a doctor has the most consistent effect of the social capital measures considered, being positively associated at least at the 10% significance level with WTP (but generally at the 5% level) for all the valuation questions for the high social capital, 'miniaturised community' and traditionalist groups.

In the civic engagement group (table 24), membership in a parents or alumni association has a positive correlation with WTP in the full regression results. Membership in a political party has a strongly significant (1% level) association with WTP for the high income group, but a negative association for the low income group (10% level). In the traditionalist group those who volunteered in the previous year also stated lower WTP, controlling for other factors.

Table 24 - Regression results for the 'civic engagement' variables

	Full regression			High income			Low income		
	cont. WTP 5	cont. WTP 10	latent WTP 5	cont. WTP 5	cont. WTP 10	latent WTP 5	cont. WTP 5	cont. WTP 10	latent WTP 5
3 Civic engagement									
Sports club (=1)						804.6 **			
Political party (=1)				2,990.4 ***	2,596.5 ***	2,749.9 ***	-988.0 *	-1,258.3 *	
NGO (=1)								1,635.9 *	
Cultural or social club (=1)									1,090.4 **
Religious organisation (=1)									
Neighbourhood group (=1)									
Parents or alumni association (=1)	305.6 *	440.7 **	506.1 ***		1,115.4 ***				
Volunteering (=1)		-316.7 *							

	Miniaturised community			Traditionalists		
	cont. WTP 5	cont. WTP 10	latent WTP 5	cont. WTP 5	cont. WTP 10	latent WTP 5
3 Civic engagement						
Sports club (=1)						
Political party (=1)						
NGO (=1)						
Cultural or social club (=1)						
Religious organisation (=1)						
Neighbourhood group (=1)						
Parents or alumni association (=1)						
Volunteering (=1)				-893.1 **	-1,190.7 ***	-908.4 **

	Low social capital			High social capital		
	cont. WTP 5	cont. WTP 10	latent WTP 5	cont. WTP 5	cont. WTP 10	latent WTP 5
3 Civic engagement						
Sports club (=1)						
Political party (=1)						546.3 *
NGO (=1)						
Cultural or social club (=1)						
Religious organisation (=1)						
Neighbourhood group (=1)						678.1 **
Parents or alumni association (=1)						
Volunteering (=1)						

Note: *** 1% significance; ** 5% significance; * 10% significance. Sample C results.

5. Conclusions

As far as was possible to determine in the literature review this chapter constitutes the first investigation of how measures of institutional trust may be related to WTP for mortality risk reductions of the type used to establish VSLs for use in cost-benefit analysis. The trust in institutions regression results show a fragmented picture of the relationship between social capital and WTP for mortality risk reductions. There is some evidence of a relationship for some types of social capital, especially when the sample is divided by type of economic or social capital group, where some more consistent results appear between the different WTP questions. The relationship between trust in government ministries and WTP is significant and positive for the low social capital group (those that generally distrust other people and are not members of a civic society group), and significant and negative for the traditionalist group (generally trust other people and are not members of a civic society group). The other measures of social capital collected (socialising, availability of support from other people, and civic engagement) also resulted in some instances of significant association with WTP.

There are several instances in the analysis where the standard measures of social capital used were found to be related to stated WTP, and as such it is not possible from the results to make a claim that social capital, defined broadly, does not have a significant associative relationship with WTP for mortality risk reductions. As such the relationship between social capital and stated preferences may deserve further investigation, especially if causal links are possible to investigate (recognising that appropriate causal research is difficult in the social capital and health research). Insights resulting from the analysis that may guide future research on this issue include the likely importance of segmenting the sample into different socio-economic groups, namely into different social capital groups, as these displayed different pattern of association in the Mexican data that was used.

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Chapter 5
Hedonic pricing of air pollution in the Mexico City Metropolitan Area

The hedonic pricing method is now well-established as a means to monetise the economic value of non-market goods. It has been applied to monetise the value of air pollution in several developed economies, most prominently in the U.S.A. Previous applications of the technique to developing country contexts are however extremely rare, with the literature that does exist raising some questions about the reliability of its econometric findings. The analysis presented here aims to offer a first methodologically robust econometric analysis in a developing country context, based on a comprehensive dataset, which meets the credibility requirements for a hedonic pricing regression.

This chapter reports on a hedonic pricing analysis of the effects of air pollution (PM10, PM2.5 and O3[57]) on house rental values in metropolitan Mexico City. The empirical analysis considers controls for spatial autocorrelation and spatial error correlation and for possible endogeneity of the air pollution variables through a spatial regression model and instrumental variables. The main finding is that there is evidence for the pricing-in of air pollution into rental values in Mexico for PM10 and for PM2.5, but not for O3. A conservative estimate of the willingness to pay for marginal reductions in PM2.5 was calculated at USD 122.72, while for PM10 it was calculated at USD 24.53.

1. Literature review

There is a lack of hedonic pricing research in developing countries (Greenstone & Jack, 2013; Yusuf & Resosudarmo, 2009). This is in most cases either due to a sparsity of data, as hedonic pricing is typically data-intensive or may make use of merging data from different sources (which then requires multiple data collection exercises to have been conducted), or to concerns about the lack of functioning markets in such countries (which would invalidate the analysis as observed prices would not reflect free market transactions). In the field of hedonic pricing of air pollution only two studies

[57] PM10 is particulate matter less than 10 micrometres in size; PM2.5 is particulate matter less than 2.5 micrometres in size; and O3 is ground level ozone.

exist[58]. The first such study to be published, by Yusuf & Resosudarmo (2009), found correlations between three types of air pollution and property rents in Jakarta (lead, total volatile hydrocarbons, and SO2; but not for PM10, CO and NOx) on a sample of 470 observations. However, the study does not control for possible endogeneity in the air pollution variables. This is a particularly important issue in the hedonic pricing of air pollution as property market rental and purchase values can be affected by many factors and it is unlikely that all of these would be captured in a regression (i.e. there is a significant risk of omitted variable bias). For example, areas with poor air quality may also be areas where there is increased economic activity, urbanisation, congestion, or crime (all of which could also affect property values), and not all of these measures may be available to be included as regressors in the hedonic pricing equation. If that is the case then the air pollution measures employed are not independent from unobserved characteristics, i.e. from the error term. This can lead to significant biases in coefficients (Anselin & Lozano-Gracia, 2008; Smith & Huang, 1995). The authors test for spatial dependence in their data but do not find evidence that it exists.

A second study on the hedonic pricing of air pollution in a developing country, in three Mexican cities, is that by Gonzalez, Leipnik, & Mazumder (2013). The authors find significant and negative relationships between PM10 and property prices, based on a sample of 4,267 observations. The study uses monthly property sales data (over 15 months in 2003 and 2004) and 4 to 6 month lagged monthly rainfall as an instrumental variable for contemporaneous PM10 ambient concentrations. The time lag is aimed at capturing air pollution as it would have likely been observed by buyers at their final visit to the property before purchasing (rainfall patterns significantly affect air pollution patterns, but are considered in the paper unlikely to be correlated with omitted variables), which is taken as a proxy for the perception of the air quality around the property by buyers (i.e., buyers are considered to be myopic in that they do not consider the full distribution over time of pollution around the property, but only the level in the distribution observed during their last visit). However, the use of monthly rainfall patterns (which suffer from significant seasonality) as an instrument presents a risk that the instrument may not be valid as it may separately correlate with other seasonal variables that would also affect house prices. Although this risk is acknowledged in the paper the issue is not further addressed in the analysis. If such correlations do exist that would mean that the instrument would not be valid as an exogenous source of variation in the hedonic regression.

[58] There are other studies in developing countries that include air pollution measures as control variables, but which do not focus on these specifically as variables of interest. As air pollution is not the primary concern in these studies they do not attempt to control for possible endogeneity of its coefficient (for example Zheng & Kahn, 2008).

To perform a simple test on Gonzalez et al. (2013)'s hypothesis of exogeneity of monthly rainfall from unobserved monthly factors, percent changes in the average monthly rainfall in Mexico City (Federal District) were correlated with percent changes in monthly industrial production[59] in the city (change in monthly industrial production in Mexico City is a variable that cannot be included in the hedonic models as there is no data for sub-city level variation, but is one which would affect seasonal air pollution in the city). For the rainy season months (June to August) there is little evidence that rainfall and industrial activity are correlated (-0.01). However, for the winter months a significant correlation exists (0.48). That is, for the winter months rainfall is likely correlated with the error term in the hedonic regression and so does not meet one of the requirements for being a valid instrument (Wooldridge, 2002). Other such seasonal correlations with unobserved variables may exist when using monthly meteorological data as instrumental variables. Given that meteorological variables are often used as instruments in hedonic pricing analysis (but usually in yearly form) this highlights the need to work with yearly data when possible to control for seasonality, or otherwise to find alternative, exogenous instruments that are not subject to seasonality.

A final issue with the Gonzalez et al. paper is a failure to address potential simultaneous spatial dependence between observations through the use of an appropriate spatial regression model. Spatial dependence is a common issue in the hedonic pricing of property values, and one that can have a significant effect on estimates (Anselin & Getis, 2010; Brasington & Hite, 2005; Kim, Phipps, & Anselin, 2003). In the presence of spatial dependence the OLS coefficients will be biased and their estimation inefficient. Gonzalez et al. use a (postal code) fixed effects model, which, while capturing *fixed spatial relationships* - such as distance of a location to sites that may affect property values (underground stations, schools, etc.) -, does not address spatial *autocorrelation* between locations, in which the occurrence of an event in a location affects the likelihood of that event occurring in neighbouring locations – i.e. similar values of the variables used in the regression may be spatially clustered whereas OLS would assume they are randomly distributed (Anselin & Arribas-Bel, 2013; Kim, Phipps, & Anselin, 2003).

This chapter then aims to produce a first hedonic pricing analysis of air pollution in a developing country that addresses these methodological issues, with a view to establishing whether air quality affects property market decisions in that context.

[59] Monthly industrial activity data was sourced from the Monthly Indicator of Industrial Activity by Federal Entity ('Indicador Mensual de la Actividad Industrial por Entidad Federativa').

2. Methodology

The theoretical model for hedonic pricing analyses was first formalised by Rosen (1974). The hedonic housing model is based on the concept of housing as a composite good[60]. The component parts of the good are assumed to be separately observable. The full model is two-stage for non-localised (market-wide) changes in the good being valued (such as changes to air pollution regulations in a city). In the first stage the *hedonic price function* is calculated:

$$P = P(z)$$

Where *P* is the price of housing property and *z* is an n-vector of property characteristics. One such characteristic is air quality at the property's location. In general these characteristics can be thought of as being divisible as: intrinsic to the property (number of rooms, quality or type of materials used, liveable area, presence of a garden, etc.) or locational (neighbourhood crime levels, distance to nearby schools, distance to transport links, neighbourhood environmental quality, etc.). The shape of the hedonic price function for an attribute cannot be generally known from theory, but the expectation is that it is non-linear (and probably, in many cases, with a concave shape reflecting expected decreasing marginal utility from acquiring more of the attribute).

The implicit price of any one characteristic z_i (e.g. air quality) is given by:

$$\frac{\partial P(z_i)}{\partial z_i}$$

Optimising households will acquire a property where their household utility is maximised, such that the marginal willingness to pay (WTP) for an attribute is equal to that attribute's implicit price. In practice, in a linear model, this would be the estimated coefficient on the air quality variable.

Note that in the first stage of the model only information on the physical characteristics of the properties being transacted is used (information on the characteristics of buyers/renters or

[60] I.e. a good that can be defined as being an assembly of many varying different component characteristics, but that is nonetheless traded in a single market. Typical examples of composite goods are cars (which can be purchased with different combinations of acceleration, colour, etc. in the car market) or houses (which can be purchased with different combinations of number of rooms, number of floors, neighbourhood safety levels, etc. in the housing market).

sellers/landlords is not used in the first stage). This is because the first stage is concerned with discovering what is the competitive equilibrium in the market for the good's various characteristics (the hedonic price function is an envelope function made of points where many demand and supply curves meet in a competitive equilibrium), but it is not concerned with the definition of either demand or supply schedules for the characteristics.

In the second stage of the model the implicit price estimated in the first stage is regressed on air quality and other property characteristics ($z_1 \ldots z_n$) and household socio-economic characteristics (α_j - including income and expenditure on other goods) to define an *inverse demand function* for air quality:

$$P_{AQ} = f(z_1 \ldots z_n, \alpha_j)$$

That is, in the second stage of the model the implicit prices from the first stage are regressed on characteristics *z* and on information from buyers/renters to generate a demand function for the characteristic of interest. The demand function is necessary to calculate welfare changes where these changes are non-marginal (as may be the case with significant changes to air emissions legislation). In general the literature does not attempt the estimation of the second stage of the model as it presents significant econometric issues, but focuses instead on the first stage, where only a marginal willingness-to-pay is obtained. This is also the approach taken in this chapter. For a fuller discussion of the hedonic pricing method, including issues with second stage estimation, see Haab & McConnell (2002), Palmquist (2005) and Taylor (2003).

Assuming that there is perfect competition in the rental and property markets the price of an owned property is equivalent to the discounted sum of future annual rents that property would receive in the rental market. The implicit rental value *r* of a property characteristic z_i can be converted from the implicit property price *p* for that characteristic using discount rate τ, assuming an infinite life to the property for mathematical convenience (Day, Bateman, & Lake, 2007):

$$r_{z_i} = \tau . p_{z_i}$$

Finally, there are two econometric-related issues of concern when calculating marginal WTP for air pollution reductions: possible endogeneity of the air pollution variable and simultaneous spatial dependence between observations.

Endogeneity of the air pollution variable would result from the presence of relevant omitted variables in the error term that affect both rent values and the level of air pollution, such as local economic activity levels (Chay & Greenstone, 2005). In the presence of OVs the regression coefficient on pollution is likely to be biased (Wooldridge, 2002). One strategy to control for OVs is to use an instrumental variable approach. Instrumental variables are implemented using two-stage least squares regressions, where in the first stage the air pollution variable is predicted by regression on a set of instrumental variables (or instruments) and in the second stage these predicted values, free from correlation with the error term, are used in a hedonic pricing regression. A good set of instruments should then be 1) relevant (the instrument must be related to the endogenous variable) and 2) exogenous (the instrument must be related to the dependent variable only through the endogenous variable). The set of instruments must also sufficiently explain variation in the endogenous variable. Taylor (2003) sets a thumb-rule minimum of 20% R^2 in the first-stage of 2SLS for the instrument to be considered acceptable.

Spatial dependence (spatial autocorrelation and spatial error dependence) between observations exists when similar observations are located in proximity of each other (in the case of hedonic pricing of air pollution typically geographic proximity, although strictly speaking data may be 'spatially' dependent without being in geographic proximity). The practical implication is that for a variable where spatial dependence is present there is less information available for the econometric analysis than the sample size would suggest (the regression is done on clusters of information rather than on independently occurring individual observations). The effect of naively applying a standard regression approach to spatially dependent data is to produce biased and inconsistent coefficients (Anselin, 2001; LeSage, 2008).

3. Study context

The geographic context for the hedonic pricing analysis is the MAVM, as described in chapter 1. The analysis in this chapter and in chapter 6 focuses on the following pollutants: PM10 (particulate matter less than 10 micrometres in size), PM2.5 (particulate matter less than 2.5 micrometres in size), and O3 (ground level ozone). Air quality measurements of PM10 and PM2.5 are reported in micrograms per cubic metre (μg/m3) and O3 in parts per billion (ppb). The main identified negative health impacts of these pollutants are respiratory and cardio-vascular complications, including both morbidity and premature mortality effects (Hunt, 2011; Lepeule, Laden, Dockery, & Schwartz, 2012). These impacts can be observed both in the short term, due to peaks in pollution (acute effects), and in the longer term, due to permanent exposure to pollution (chronic effects). There is also evidence that air pollution is a contributing factor to lung cancer (Pope, Burnett, & Thun, 2002), affects cognitive performance in children (Lavy, Ebenstein, & Roth, 2014), and is associated with diabetes (Weinmayr, Hennig, & Fuks, 2015).

The main sources for atmospheric concentrations of PM10 and PM2.5 in the MVMA are industrial production, power plants, diesel vehicles, and volcanic activity. The main sources for O3 concentrations are road transport, natural sources, power plants, and combustion in farms (SEMARNAT, 2013).

4. Data sources

Air Pollution Data

The air pollution data used in the analysis is sourced from Mexico City's Atmospheric Monitoring System[61]. The Automatic Atmospheric Monitoring Network (RAMA) dataset is used. The RAMA network has broad geographical coverage (especially for PM10 and O3), is frequently maintained and updated, and produces reliable data, a set of characteristics that are uncommon to jointly occur in a developing country context[62].The RAMA network's PM10, PM2.5 and O3 concentration data used in the analysis was collected throughout the year, at every hour, at several stations over the 2005-2010 period (the number of stations collecting data on each pollutant varies by pollutant). The air quality values tested in the empirical analysis are calculated yearly averages of 24-hour daily averages and yearly averages of 98th percentile values.

Information on levels of pollution is publicised to the local population through the IMECA air pollution indices[63], which are based on hourly RAMA data. The level of information in the population about their levels of exposure, and health and other consequences of that exposure, is important in the formation of preferences for the air quality 'good' and, more specifically, for these preferences to be revealed through the hedonic pricing method: although information is made available to the public through the IMECA system, that is not enough to say that the population are sufficiently well informed. This is a type of information bias, whereby the idea that the respondent has of their own exposure to pollution, and of the effects of pollution, may be significantly different from what these are in reality, which would compromise the validity of the valuation exercise. Unfortunately no

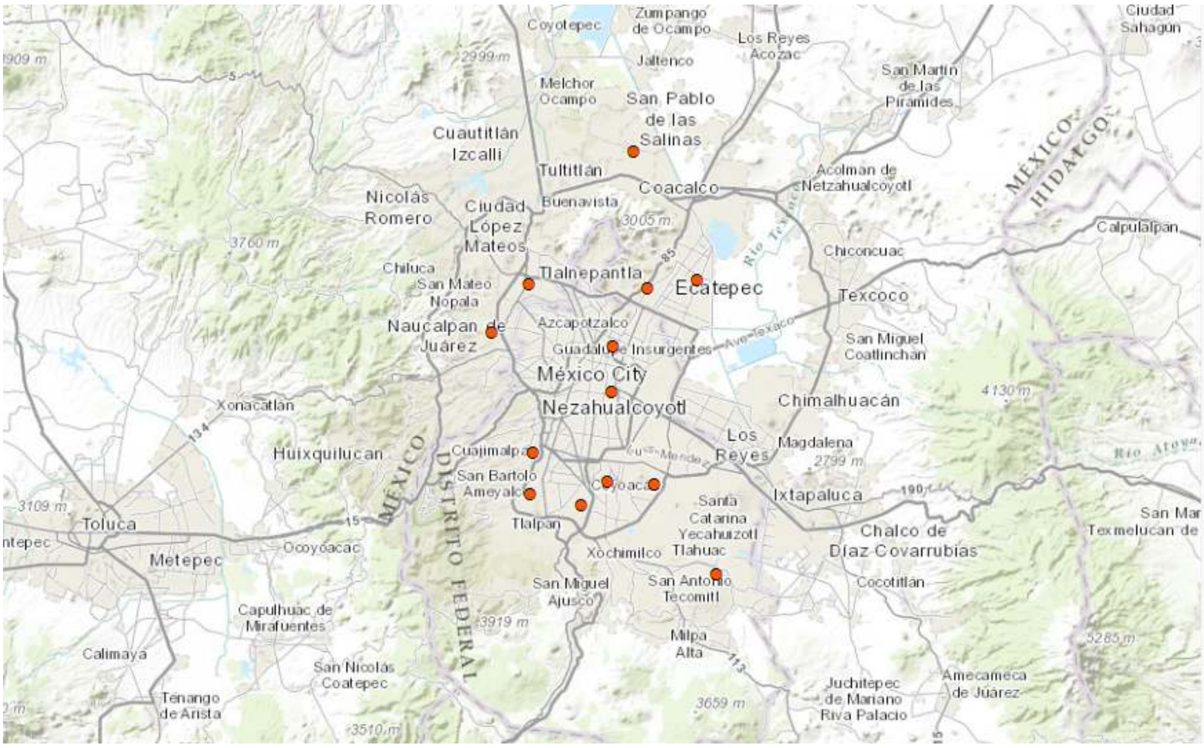
[61] Sistema de Monitoreo Atmosférico de la Ciudad de México (SIMAT): http://www.aire.df.gob.mx/default.php

[62] For example Beijing and other large Chinese cities have large air quality monitoring networks, but there is evidence that the data that is released to the public may not reflect real air quality conditions (Andrews, 2008; Chen, Jin, Kumar & Shi, 2013).

[63] IMECA ('Indice Metropolitano de la Calidad del Aire' – Metropolitan Air Quality Index) is a real-time air quality information system through which MAVM inhabitants are made aware of the levels of pollution and precautions that should be taken across the city. See:

http://www.aire.df.gob.mx/default.php?opc=%27ZaBhnmI=&dc=%27Zw (in Spanish).

Figure 4 – Location of PM10 monitoring stations used in the analysis



Source: ArcMap 10.1 (map); Secretaría del Medio Ambiente del Gobierno del Distrito Federal - Dirección de Monitoreo Atmosférico (station locations)

studies on the real level of information amongst the public could be identified[64].

There are several instances of missing data in the RAMA dataset. Missing data ranges from non-consecutive 1-hour observations to several consecutive months of missing data at a station: the data is not missing at random. Where data are not missing at random a corrective statistical procedure has to be introduced (Gelman & Hill, 2007; Patil & Bichkar, 2010). Otherwise the following problems may occur: 1) the sample might not be representative – possible biased sample; 2) statistical packages may drop observations where there is missing data and this would need to be otherwise addressed – computational problems (in our case not an issue as data is aggregated to years); 3) and thus relevant information in the datasets is not being used – loss of analytical efficiency (Norazian, Mohd Mustafa, Ahmad Shukri, & Nor Azam, 2006).

[64] There is a study available on the perception of *institutional* stakeholders about the level of information among the public (Simioni, 2004), but no direct measure of public awareness. Also, the Simioni (2004) study predates several important changes to Mexican legislation on the provision of, and access to, environmental information (OECD, 2013). The perception of institutional stakeholders in Simioni (2004) was that the level of information among the public was rudimentary.

To correct the problem of hourly missing air pollution readings, inverse distance weighting (IDW) using data from nearby stations is used to interpolate the hourly observations and fill in the remaining data gaps. This procedure results in complete PM10, PM2.5, and O3 concentration datasets for every hour in the 2005-2010 period. The use of IDW to calculate missing values is computationally simple and allows taking into account actual registered observations from the other monitoring stations in estimating missing values. From the corrected dataset daily average air pollution concentrations are then calculated for each day in each year at each station. The yearly average of daily average PM10, PM2.5 and O3 concentrations and the yearly 98th percentile of daily average concentrations are then calculated. The matching of air pollution concentrations from each station to the AGEB level is done by: 1) assigning a geographic centroid to each of the AGEBs; 2) using the ArcMap 10.1 geoprocessing tool to geographically interpolate pollution using inverse distance weighting and to assign the yearly average of daily average air pollution concentrations and the yearly 98th percentile of daily average concentrations to AGEB centroids (figure 5, below). The maps below show the distribution of interpolated air pollution for the year 2010 (yearly average of daily averages). Note that the interpolated areas vary in size as not all air pollution stations measure the three pollutants considered in the analysis. Also, the distribution of air pollution varies significantly across central MAVM. For example, PM10 air pollution concentrations are highest in the Northeast, whereas O3 concentrations are highest in the Southwest. This occurs as the type of pollution source varies geographically (for example, a high concentration of small industry in the Northeast causing higher levels of PM10; more intensive road traffic and different chemical atmospheric processes in the Southwest causing higher levels of O3).

Meteorological Data

Meteorological variables are used in the analysis as instrumental variables. These are: temperature, humidity, wind speed (all of which continuous; including both yearly average of daily averages and 98th percentile of daily averages), and wind direction (categorical, with 8 categories; including both mean and median). Interaction terms for relative humidity and temperature and for wind speed and wind direction are also included. There is evidence in the natural sciences literature that these variables affect air pollution concentrations (Gomez-Perales, Colvile, Nieuwenhuijsen, 2004; Edgerton, Bian, Doran, et al., 1999; Parrish, Singh, Molina, et al., 2011), including for the interaction terms (Qiu, Yu, Wang, et al., 2013; Ren, O'Neill, Park, et al., 2011This indicates that these variables may be suited for use as instruments (see further discussion on instrumental variables in the Econometric Analysis section). The data is sourced from Mexico City's Environmental Monitoring System for Meteorological variables (REDMET).

Property data

The dependent variable in the hedonic regression is yearly rent value as reported by renters. Rental data as well as the physical characteristics of the respective properties are sourced from the biennial Mexican Household Income and Expenditure Survey (Encuesta Nacional de Ingresos y Gastos de los Hogares - ENIGH)[65]. Three years of ENIGH survey data were used to form a pooled cross-sectional dataset. These years are 2006, 2008 and 2010[66]. The rent and property characteristics observations are matched at the AGEB[67] level with their corresponding air pollution level for 2005-06, 2007-08, and 2009-10 respectively, i.e. each property has a corresponding air quality level for the year in which it was observed and for the preceding year. The criteria for inclusion of a physical characteristic of the property in the analysis is whether that characteristic is a fixed feature or is likely to be a fixed feature of the property – whether there is a water tank on the roof or not is kept as a variable, whereas whether there is a TV in the property is dropped.

Most location-related characteristics are drawn from the Mexican National Institute of Statistics and Geography's (INEGI) National Geostatistical Framework (Marco Geoestadístico Nacional)[68]. The locational variables measure distance to the nearest feature of interest in kilometres, except for Mexico City's International Airport where dummy variables for distance under 3 kilometres and between 3 and 5 kilometres were considered. These include proximity to: public squares, underground stations, schools, shopping centres, churches, green spaces, markets and medical services. Measures of distance to the city centre (Zocalo) and the main business district (Santa Fe) were also considered. Homicides per 100,000 inhabitants were used as a proxy for crime, as murders tend to be reported whereas other types of crime can be significantly under-reported, and are sourced from the Secretaria de Gobernacion's Common Law Criminal Incidence (Incidencia Delictiva del Fuero Común) database[69].

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65 Link: http://www.inegi.org.mx/est/contenidos/proyectos/encuestas/hogares/regulares/enigh/default.aspx.

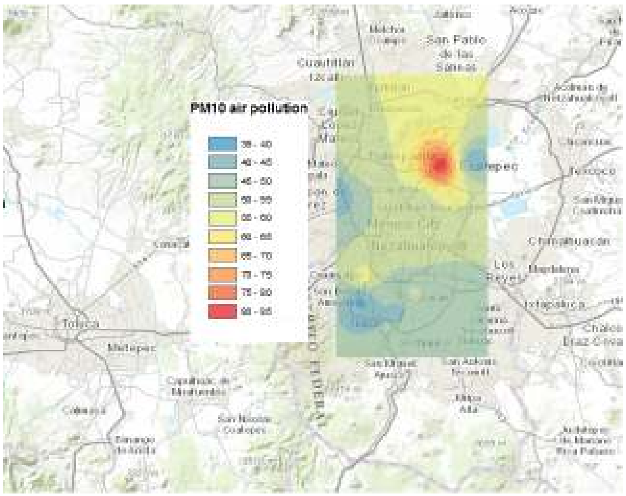
66 Monetary values were deflated using the World Bank's Data Bank GDP deflator values (to 2006 USD) http://databank.worldbank.org/ddp/home.do.

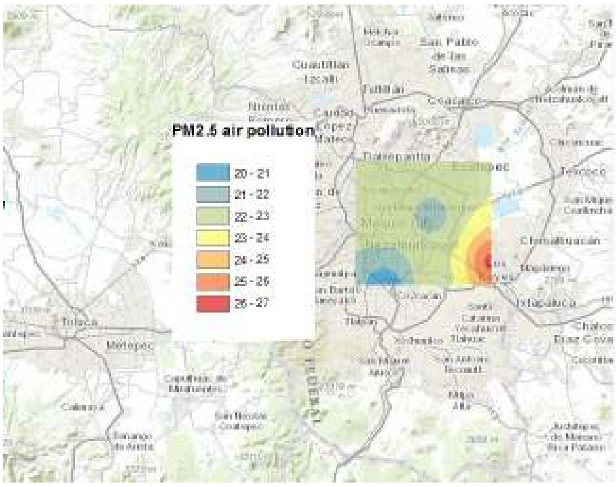
67 ENIGH AGEB data are not publicly available, but were kindly provided by Mexico's National Institute of Statistics and Geography (INEGI).

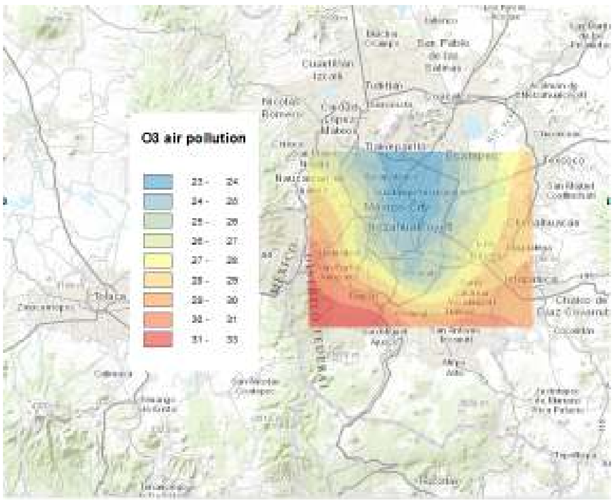
68 Link: http://www.inegi.org.mx/geo/contenidos/geoestadistica/M_Geoestadistico.aspx.

69 Link: http://secretariadoejecutivo.gob.mx/incidencia-delictiva/incidencia-delictiva-fuero-comun.php.

Figure 5 – Examples of inverse distance-weighted interpolated yearly averages of daily average PM10, PM2.5 and O3 concentrations (coloured areas, 2010 data)







Source: maps made using ArcMap 10.1. Inverse Distance Weighting extrapolation, based on 2010 average of daily average concentrations as measured at monitoring stations. PM10 and PM2.5 in µg/m³; O3 in ppb.

Two types of location within the city dummies were included to capture fixed locational effects. The first aggregated the boroughs (Delegaciones and Municipios) into five zones in the city, namely city centre, northeast, northwest, southeast and southwest. This format approximately matches the one used in the IMECA air pollution warning system (i.e., this is the geographical breakdown of the city on which air pollution threat levels are reported to the population)[70]. The second was the boroughs themselves.

There are examples in the literature of the use of rental values as the dependent variable in hedonic pricing analysis (instead of property prices; e.g. Day, Bateman, & Lake, 2007) but care must be taken: i) to ensure that the rental market is competitive - rent controls in Mexico were removed in the mid-1990s; and ii) when interpreting the regression coefficients, as, contrary to house prices, rents are not assumed to capitalise the effects of future expected (i.e. not yet materialised) changes in the characteristics of the houses (renters cannot guarantee use of future changes; Palmquist, 2005; Taylor, 2003), may capitalise current changes with a lag (Lang, 2015), and may not capitalise those changes fully (Grainger, 2012). Hedonic pricing estimates from rental values should then be seen as lower bound estimates of the full hedonic benefit for reductions in a 'bad' such as air pollution.

Two rent outliers were removed before running the regression, as were observations where more than one family occupied the same property (to avoid double-counting property characteristics). The final count is of 1,557 single-occupancy renting observations with associated independent variables for PM10, 922 for PM2.5, and 1,648 observations for O3. Note that the number of observations varies with the geographical extent of the interpolated pollutants maps - that is, with the availability of data on each of the pollutants at the different monitoring stations.

Descriptive statistics can be found in Annex 5.1.

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[70] The city centre includes the boroughs of Benito Juarez, Cuauhtemoc, Iztacalco, and Venustiano Carranza; northeast includes Coacalco de Berriozabal, Ecatepec de Morelos, Nezahualcoyotl, Tlalneplanta de Baz, Chimalhuacan, La Paz, and Ixtapaluca; northwest includes Azcapotzalco, Miguel Hidalgo, Gustavo A. Madero, Atozapan de Zaragoza, Cuautitlan, Cuautitlan Izcali, Naucalpan de Juarez, and Tultitlan; southeast includes Iztapalapa, Tlahuac, Xochimilco, Chalco, and Valle de Chalco Solidaridad; southwest includes Alvaro Obregon, Coyoacan, La Magdalena Contreras, Miguel Hidalgo, Tlalpan, Huixquilucan, Cuajimalpa, and Cuajimalpa de Morelos.

5. Econometric analysis and results

Test of functional form

Given that the actual shape of the hedonic price function is market-determined and cannot be known *a priori*, it is useful to test for the best functional form fitting the data. The Box-Cox test for functional form is applied[71] with the following outcome:

```
                                                  Number of obs   =       1557
                                                  LR chi2(27)     =    1805.69
Log likelihood = -16221.522                       Prob > chi2     =      0.000
```

renta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
/theta	.009214	.0200784	0.46	0.646	-.0301388	.0485669

Test H0:	Restricted log likelihood	LR statistic chi2	P-value Prob > chi2
theta = -1	-17255.576	2068.11	0.000
theta = 0	-16221.627	0.21	0.647
theta = 1	-17447.854	2452.66	0.000

The value for theta is not significantly different from zero and the Box-Cox test results in a very low LR statistic for a theta coefficient equal to zero. This indicates that a log-linear functional form offers the best data fit. The rent value is accordingly transformed to `lnrenta`.

Test of spatial autocorrelation

A common issue that arises with property value data is the presence of spatial autocorrelation (the value of an observation being affected by the value of nearby observations), in which case OLS is biased and inefficient. The Moran's I test can be used to measure the presence of spatial autocorrelation in the dependent variable. Moran's I makes use of a spatial weights matrix, built on the longitude and latitude of each of the properties (or in the present case the centroid of the AGEB in which the property is located, which closely approximates actual location), as a basis for assessing whether proximity dependence is present in the data. The user-generated commands `spatwmat`

[71] Stata 12 software was used for the econometric analysis.

and `spatgsa` for Stata (Pisati, 2001) are used to run the test[72]. The Moran's I test for spatial dependence is calculated for both the observable data and for the residuals. Results are show in Annex 5.2 (2006 is shown as an example for the observable data, 2008 and 2010 offering similar results).

The Moran's I coefficients on the dependent variables are mostly moderate, positive and significant (low p-values), showing the existence of positive spatial autocorrelation in the data, which cannot be captured by standard OLS. This result calls for the use of a spatial lag regression model, whereby a lag of the dependent variable is included as one of the regressors in the model (given that a spatial structure in the data is known to exist: rent in one location is similar to rent in locations in its proximity). The inclusion of the spatial lag allows the estimation of parameters that explain variation in the data independently of variation that is due to neighbour effects.

In addition, unobservable factors may also be spatially correlated, which would violate the OLS assumption that the error terms are uncorrelated. The spatial lag regression model mentioned above, which is used to remove spatial dependence in the dependent variable alone, does not address the problem of spatial dependence in residuals (another way of saying this is that even if the dependent variable is not spatially correlated, the fact that the underlying data used in the regression is spatial data may in itself imply spatial relationships that are unobservable and would lead to inefficient estimation). The Moran's I analysis shows that the hypothesis of spatial correlation in the error term cannot be rejected. In this case the spatial error model (spatial adjustment to the error term) can be used.

As such we can reject the null hypothesis that there is zero spatial autocorrelation in the rental data and in the error term. Accordingly, the regressions used in the analysis take into account spatial autocorrelation. The spatial lag and spatial error model are used in conjunction[73]. The Stata commands used in the spatial regressions are contained in the SPPACK module (Drukker & Peng, 2012), including the `spivreg` command which allows two-stage least squares spatial regressions (i.e., with instrumental variables) to be run.

[72] The Moran's I test used an inverse distance weights matrix encompassing observations within 10 Km for each individual year (to avoid spurious location dependence across years).

[73] In which case the spatial econometrics literature refers to the SARAR model - spatial autoregressive model with spatial autoregressive errors. In the following the SARAR model is used when mention is made of spatial regression analysis results.

Instrumental variables

The use of conventional tests for endogeneity of the air pollution variables and the validity of the instrumental variables considered (the meteorological variables that were described above) is problematic given the spatial nature of the data. However, there is a possibility that the air pollution variables may be endogenous in the hedonic pricing model (for example due to unobserved economic activity levels or traffic patterns over the geographical area that are not captured in the regression). As such, an instrumental variable approach is also considered in the analysis. As is discussed below, the results are only marginally affected by the use of instrumental variables when compared to the other approaches (OLS and spatial regression), an indication that any existing endogeneity is not significantly biasing the conclusions that can be drawn from the data (as was the case for the spatial effects present in the data). The instruments each explain between about 45% and 90% of the variation in the air pollution variables, well above Taylor's (2003) recommended minimum 20% combined explanatory power for the instruments to be considered sufficient. Applying classical OLS endogeneity tests on the air pollution variables results in a failure to reject exogeneity (see Annex 5.3). As such an instrumental variable approach would in principle not be justified. However, the data are spatially distributed and the standard OLS endogeneity test may be affected by spatial dependence in the error term.

As using (valid) instrumental variables when the independent variable being instrumented is in fact not endogenous merely results in the non-instrumented and the instrumented coefficients being similar to each other, and given the impossibility to identify an endogeneity test for spatial data, the analysis uses several methodological approaches to observe whether in practice endogeneity or spatiality have a significant effect on the coefficients on the air pollution variables (given that the question being considered in the hedonic pricing analysis is essentially an empirical one, i.e., are the coefficients on the air pollution variables significant and of the expected sign, and what values do these coefficients take). The different methodological approaches considered are then variations on whether an instrumental variable approach and a spatial regression approach are used or not:

Table 25 – Methodological approaches tested

	No spatial regression	**Spatial regression**
No instrumentation	OLS	Simple spatial regression
Instrumentation	Two-stage least squares	Spatial regression with instrumentation

Econometric analysis

The process to arrive at a final parsimonious model that can be considered to have sufficient quality to establish whether there is an effect of air pollution on rental values is run in stages:

1. The first stage starts with a conceptual model that includes all the potential variables (listed in Annex 5.1), as rental rates could be affected by any of these factors. However, it is likely that given the number and nature of the variables in this starting point model that there would be several variables that are collinear, which would affect significance statistics in the regressions (to lower t-tests and increase p-values). To address multicollinearity the variance inflation factors (VIF) for this regression are calculated and factors greater than 4 are flagged[74]. The highest of these is dropped and the test is run again until no variable has a VIF above 4 (with the exception of the air pollution variables).

   The variables that are flagged at this stage are `regadD`, `cua_coc`, `SHOPCEN`, `Dst_Zocalo` and `Dst_SantaFe`. However, transforming all the locational (continuous) variables from distance in metres to the log of distance in metres removes their excessive collinearity (excluding `Dst_SantaFe`). Accordingly, all the distance variables are transformed into logs and the new starting model includes all of the variables available but `Dst_SantaFe`, `regadD` and `cua_coc`.

   Also at this stage the post-estimation correlation coefficients between the variables are all below 0.5, which gives assurance that the results to be obtained in later stages are not unduly affected by collinearity by dropping variables that should in fact be in the model (except for some interactions slightly above 0.5 between the year and location in the city dummies and other variables – these were again tested to see if these remain an issue once other variables have been dropped for not being significant in stage 3).

2. In the second stage, using the new model defined above (with reduced collinearity), the variables are then dropped stepwise, always dropping the least significant variable first (highest p-value), until only variables with a p-value equal or lower to 0.1 remain. An exception to this rule is again the year dummies and the location in the city dummies, which are kept until the next stage.

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[74] This is the typical level above which the variables are considered as likely to cause collinearity in the model, equivalent to standard error inflation factors being equal to two (the square root of the variance inflation factor) or more.

3. In the third stage the variables are again tested for their VIF and post-regression multicollinearity, now including the year and location in the city dummies. Some of these are still at this stage highly correlated with air pollution. This indicates that they may be leading to artificially high p-values and to the rejection of air pollution as significant (at this stage PM10 has an expected negative sign but is not significant and O3 has an unexpected positive sign but is not significant; PM 2.5 has a negative sign and is significant). The year and dummy variables that are highly collinear with air pollution and that are not significant are dropped and the significance (p-value) of air pollution improves. The process is run again from stage 1 minus these dropped dummy variables to guarantee that none of the variables dropped in stage 2 would have been kept with the high collinearity and insignificant year and city zone dummies having been removed from the start of the process. Finally it was confirmed that the coefficient on the air pollution variables didn't change significantly with the removal of non-significant and highly correlated year and location dummy variables, even if their significance improved.

Results

The final regressions for the spatial regression model with instrumental variables are shown in table 27 (note that of the non-pollutant variables only those that were significant were kept in the regressions). After the procedure above the PM10 variable becomes significant at a 10% level, with a coefficient of -0.004. PM2.5 is also negative and significant (at a 1% level) with a coefficient of -0.021.

O3 remains non-significant with a negative sign, with a coefficient of -0.013. As such, the data available indicate that O3 is not priced into rental housing prices. The level of public awareness about exposure to, and the effects of, air pollution may be affecting these results. As O3 may not be as visible as particle matter to households renting properties in high O3 concentration areas (southern part of the city), it is possible that these household are not informed about the presence of O3 pollution in the area (despite O3 being one of the IMECA pollutants that is publicised hourly) or that they do not associate the presence of O3 with detrimental health effects, but instead consider living in 'clean' areas as PM concentrations are lower in these neighbourhoods (in which case PM pollution is more salient than O3 pollution, as revealed by the data). The analysis thus shows that only PM10 and PM2.5 have a significant effect on rental values, but all three pollutants have the expected negative sign.

There are also significant positive effects on rent for the number of rooms in the property and for most of the fixed features that would be desirable in the property (better quality of roofs, existence of a fixed water boiler in the property, of a fixed gas tank, etc.), although having a water tank on the roof was not significant for the O3 dataset. The exception here is the presence of a wash basin for clothes, which has a negative sign. This suggests that the clothes wash basin may be proxying for unobserved property features that are on average undesirable.

For the variables proxying for neighbourhood quality only the proportion of over 25s in the AGEB block with a university education was significant, while the murder rate (proxy for crime level) was not. The latter is perhaps a surprising result, but one that was consistently found in all of the regressions run.

As for the (continuous) accessibility variables (distance in kilometres), the sign on distance from the closest shopping centre was negative for the three regressions, meaning that as distance from shopping centres increases the value of rents decreases. Increased distance from medical services also reduced property values significantly for the PM10 dataset. The other accessibility variables had a positive coefficient, meaning that they are in fact considered disamenities (proximity to religious buildings and schools for all three datasets; and to markets in the PM10 and O3 datasets). There is some evidence that issues such as noise, congestion, or negative visual impacts associated with certain service buildings can lead to a negative effect on the value of properties in the vicinity (Babawale & Adewunmi, 2011; Do, Wilbur & Short, 1994). Being within 3 Km from the airport also reduced the value of rents for the PM10 and the PM 2.5 samples (10% significance), but there was no significant effect beyond that range. Distance from the historic centre (Zocalo) was not significant (and distance from Santa Fe, the central business district, was dropped from the analysis, as discussed above).

Some of the broad geographical location dummies are also significant. These tested whether locations in the northeast, northwest, southeast or southwest of the city were priced differently from properties located in the city centre. Each of these areas is considerably large, encompassing several Delegaciones and Municipios, and so a few million inhabitants too. Properties located in the northwest of the city registered reduced rents, all else equal, for all three pollutant regressions. For the PM10 dataset properties in the southeast also registered reduced rents, but rents were higher here for the O3 dataset. Also, properties in the northeast are positively valued in relation to the city centre for the PM2.5 dataset but not for the O3 dataset. These contradictory effects are related to the geographical coverage of the different datasets: for example the O3 data coverage does not reach houses as far south as the PM10 dataset, and so the PM10 dataset includes houses further from the city centre that may suffer from distance from central location amenities. The alternative disaggregation of the broad geographical dummies into boroughs (Delegaciones and Municipios) did not affect the air pollution estimates.

Finally the year dummies did not have a significant effect on rental values. Given that the sample covers the years 2006, 2008 and 2010, which represents a period of pre-economic crisis, crisis and recovery in Mexico, it was hypothesised that an effect may occur. In a meta-analysis checking the effect of time and space variation (among others) on several key variables that are often included in hedonic pricing studies in the U.S.A., Sirmans & MacDonald (2006) find that time generally doesn't have an effect on the pricing of characteristics, whereas space generally does. However, as the pricing of air pollution in this chapter focuses only on the first stage of the hedonic pricing method (i.e. only on marginal effects rather than on the fuller demand schedule for air pollution that would be the result of a second stage estimation) the results here cannot be used to conclude definitely that the valuation of air pollution was not affected by the economic crisis in Mexico. In other literature considering the effect of economic crises on non-market valuation such effects have been found. Metcalfe & Baker (2015) applied the same contingent valuation instrument before and after the 2008 recession, assessing at each point in time both a payment card and a dichotomous choice elicitation format. They find that the payment card format is sensitive to the onset of the economic crisis (leading to significantly lower values) but that the dichotomous choice format is not. They note that previous research assessing the comparability of contingent valuations over time had generally been supportive of the stability of results, albeit these tests were not previously conducted for economic downturns. Cho, Kim, & Roberts (2011), using hedonic housing pricing to assess the effect of the economic downturn on the valuation of environmental landscape attributes, also find a significant impact of the recession on coefficients (for water views, developed open space, and forested open space).

Limitations to the analysis include the geographical coverage of the pollutants, which seems to have an effect on the significance of the coefficients. Also there are variables that could not be included in the model due to data unavailability or impossibility to obtain data that does exist (for example on noise pollution). These variables could have improved overall model outcomes and confidence on the coefficients that were obtained for the air pollution variables.

Willingness-to-pay for reductions in air pollution concentrations

Care must be taken with the interpretation of the coefficients in spatial regression models: with the presence of spatial autoregressive relationships in the data each of the estimates of the independent variable that is obtained is simultaneously determined in the model (due to multi-directional location effects on the observations). As such, a change at a single location for one of the independent variables can affect estimates of the dependent variable in several locations (Pace & LeSage, 2009). To obtain approximate marginal effect estimates for the spatial regressions the method described in Drukker, Prucha, & Raciborski (2013) is followed for each of the pollutants: first, post-regression estimates for the dependent variable are obtained using the original dataset; second, the original value for the air pollution variable at a single location (AGEB) is subtracted by one unit and new predictions (based on the same regression) for the dependent variable are calculated; third, the estimated marginal effects are calculated by subtracting the first from the second prediction at the location where the change was made; fourth, estimated marginal monetary values for changes in air pollution are calculated for mean yearly rent values. The resulting estimated marginal effects are shown in table 26.

These results closely approximate the coefficients obtained in the regression, which suggests that the spatial effects found have a low impact on results (see the next section). A few caveats are required when interpreting the marginal willingness-to-pay estimates. Firstly, the values derived in the second section of the table are yearly (as they are derived on yearly rental data) rather than covering the asset life-time (fully capitalised) values that could be derived from property sales market data. If we assume that the change in air pollution to be valued is permanent, then the capitalised values would be the appropriate measure. It is possible to produce estimates for the capitalised value of air pollution reductions from rental data but this increases the uncertainty of the analysis as several assumptions need to be made (but see illustrative and conservative figures for the capitalised value shown on the third section of the table)[75].

Secondly, the hedonic pricing method recovers only a single point in the demand function for air quality and this demand function is more likely than not non-linear (more complex hedonic analyses can be performed to recover a full demand function but these are rarely attempted; see Day, Bateman, & Lake, 2007, and Boyle, Poor, & Taylor, 1999 for examples). As such these estimates are only expected to be accurate for marginal changes in air pollution but not for larger changes, which should generally be kept in mind when intending to use hedonic pricing estimates for public policy evaluation (the estimates presented here are for pollutant unit changes).

Thirdly, hedonic pricing estimates capture only a fraction of the willingness-to-pay of individuals, namely that which is related to housing market decisions (Pearce, Atkinson, & Mourato, 2006). If hedonic pricing estimates of the value of air pollution reductions are used in public policy evaluation they should be seen as lower bound estimates.

[75] Assumptions include future growth rate of income, income elasticity of demand for air pollution (see discussion on elasticities in the introductory chapter), length of capitalisation, and discount rate to apply.

Table 26 - Marginal willingness-to-pay for reductions in air pollution concentrations per year

	PM 10	PM 2.5	O3*
% rent change per unit pollutant change	0.04%	0.22%	0.14%
Mean yearly rent (MXN)	26,237	26,028	25,659
Yearly WTP in MXN (mean)	11.68	58.43	35.49
Yearly WTP in USD (mean)	1.62	8.13	4.94
Capitalised WTP in USD	24.53	122.72	74.53

* O3 was not significant in the regressions; PM10 was significant at 10%.

Note: values in 2006 prices. USD values in PPP (from OECD Statistics). Capitalised WTP is an illustration based on a discounted twenty-five year stream of benefits at a 5% discount rate (assuming no real income growth, i.e. a conservative estimate).

Fourthly, the estimates are based on rental market data which may not fully capitalise the benefits of improvements to air pollution (see discussion on the rental variable in the data sources section above). This again suggests that the estimates obtained are conservative.

The analysis above thus shows that air pollution is a significant factor in determining the value of housing in Mexico. This demonstrates that citizens in developing countries value, and are willing to pay for, improvements in air quality. The illustrative capitalised values calculated are in the lower quarter of ranges found for comparable air pollution hedonic pricing valuations conducted in the U.S.A (in a meta-analysis Smith & Huang, 1995 find values between 0 USD and 200 USD - adjusted to 2006 prices - for PM10 pollution, with more recent studies generally falling within that range, for example Chay & Greenstone, 2009).

Significance of using a spatial-instrumental variable regression with instrumental variables

This chapter is the first instance in the literature of the use of a spatial regression model, together with instrumented pollution variables, for the hedonic pricing of air pollution in a developing country

Table 27 - Spatial instrumental variables regression results for PM 10, PM 2.5, and O3

Ln(rent)	PM10			PM2.5			O3		
	Coefficient	Standard Error	p-value	Coefficient	Standard Error	p-value	Coefficient	Standard Error	p-value
Property characteristics									
Neighbourhood quality									
PM 10 (μg/m³)	-0.004	0.002	0.077						
PM 2.5 (μg/m³)				-0.021	0.006	0.001			
O3 (ppb)							-0.013	0.010	0.182
Population in neighbourhood with university education (%)	1.232	0.129	0.000	1.309	0.157	0.000	1.500	0.142	0.000
Number of rooms (`cuart`)	0.133	0.025	0.000	0.105	0.028	0.000	0.135	0.024	0.000
Roof quality dummy (`techosD`)	0.295	0.047	0.000	0.378	0.070	0.000	0.344	0.046	0.000
Water boiler dummy (`calenD`)	0.175	0.035	0.000	0.228	0.048	0.000	0.192	0.034	0.000
Water tank on the roof dummy (`tin_azoD`)	0.108	0.030	0.000	0.108	0.042	0.010			
Doesn't share toilet with another household dummy (`uso_comD`)	0.173	0.043	0.000	0.149	0.062	0.016	0.221	0.039	0.000
Clothes wash basin dummy (`piletaD`)	-0.061	0.025	0.014	-0.093	0.033	0.005	-0.051	0.024	0.036
Fixed gas tank dummy (`tan_gasD`)	0.280	0.034	0.000	0.264	0.042	0.000	0.289	0.036	0.000
Accessibility (distance in Km to...)									
Shopping centre, log (closest)	-0.057	0.020	0.004	-0.074	0.028	0.008	-0.065	0.023	0.004
Religious building centre, log (closest)	0.048	0.015	0.001	0.063	0.016	0.00	0.038	0.017	0.028
Medical services, log (closest)	-0.031	0.017	0.074						
School, log (closest)	0.030	0.012	0.015	0.028	0.013	0.03	0.041	0.012	0.000
Market, log (closest)	0.033	0.013	0.013				0.028	0.014	0.045
Airport vicinity dummy (1=less than 3 Km)	-0.087	0.050	0.080	-0.079	0.046	0.088			
Location in the city (compared to city centre)									
Northeast				0.120	0.043	0.01	-0.174	0.041	0.000
Northwest	-0.164	0.038	0.000	-0.158	0.044	0.000	-0.086	0.036	0.016
Southeast	-0.111	0.038	0.003				0.136	0.055	0.014
constant	7.665	0.446	0.000	7.807	0.547	0.000	8.330	0.489	0.000
lambda									
constant	0.096	0.037	0.009	0.119	0.048	0.013	0.017	0.038	0.663
rho									
constant	0.045	0.047	0.333	-0.082	0.060	0.170	0.133	0.046	0.004
		1,557			922			1,648	

context. However, as discussed above, there is evidence that spatial effects, while significant, are not strongly affecting the results, and that the need to instrument for air pollution is not clear in the context of the current spatial regression. To illustrate what is the significance of using an instrumented spatial regression for our dataset a comparison is made of the impact on the coefficients of interest of using spatial instrumental variables regression results with a simple linear regression, a linear regression with instrumental variables, and a spatial regression without instrumentation (all of which have been used in the hedonic pricing literature). The results for the three pollutant datasets are shown in Annex 5.4. For the three datasets the use of a linear regression leads to an underestimation of the coefficient of air pollution on housing rents when compared to a spatial regression, but the difference between these is not large. Thus, although there is a significant presence of spatial dependence in the data, the scale of the spatial effect is very small and has little impact on estimates[76]. The differences found between instrumented and non-instrumented regressions are of an overestimation for the latter in the case of PM10 and PM2.5 but an underestimation in the case of O3. However, as in the case of spatial versus linear, these differences are not large.

6. Conclusions

This chapter uses hedonic analysis to establish whether there is a significant relationship between air pollution and property rental prices in the metropolitan area of Mexico City. The method employed includes controls for spatial relationships in the data and the use of instrumental variables to control for endogeneity of the air pollution variables. The results are that PM2.5 and PM10 pollution have a significant effect on rental property prices, whereas O3 does not. It is possible that the results for O3 are due to imperfect information by renters. A conservative estimate of the willingness to pay for marginal reductions in PM2.5 was calculated at USD 122.72, while PM10 was calculated at USD 24.53. Although spatial dependence was found to be present in most of the data its effect was not strong, and so the analysis did not find this to impact significantly the value of air pollution estimates. The analysis shows that air pollution can be a significant factor in determining the value of housing property in Mexico. This demonstrates that citizens in developing countries value and, as shown by market-derived data, are willing to pay for improvements in air quality.

[76] This is indicated by the coefficients on lambda and rho in table 27 (measures of spatial autocorrelation and spatial error dependence respectively). The values for lambda and rho very between 1 and -1, with values closer to zero indicating lower levels of dependence (zero being no dependence). See Drukker et al. (2013).

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Chapter 6
Air pollution and subjective wellbeing in Mexico City

In recent years there has been a significant increase in interest in research on subjective wellbeing (SWB)[77] as a non-monetary measure of utility (the so-called 'happiness economics' literature): the concept of SWB is seen here as offering a more comprehensive coverage of an individual's utility than traditional proxies (mainly income). Some statistical offices have started to routinely collect information on subjective wellbeing, demonstrating that the concept is becoming mainstream. One of the recent applications of this concept is to the relationship between air pollution and SWB. The few existing studies that exist have found statistically significant relationships between some air pollutants and measures of SWB. In developing countries this type of empirical work has only been conducted for data on China.

Firstly, this chapter uses daily air pollution data and SWB data for the MVMA to produce a similar analysis for Mexico from that in previous research. Secondly, and in part based on existing evidence that poorer people tend to be more exposed to air pollution, it further considers income distribution aspects of the air pollution and SWB relationship (by investigating whether SWB for those in the dataset on the highest incomes has a different relationship with air pollution than for those on the lowest incomes – namely, does air quality show the properties of a luxury good – e.g., do people on low incomes 'value' air quality, as revealed by SWB, or is SWB for the poorer in society rather associated with other aspects of life, all else equal)[78].

Thirdly, one advantage of the dataset used is that extensive data on different dimensions of social capital is also available. Social capital has previously been found to be significantly associated to SWB. This allows the disaggregation of the analysis of the relationship between air quality and SWB by

[77] 'Subjective wellbeing' is described by Diener (2000) as referring to 'people's evaluations of their lives - evaluations that are both affective and cognitive'; and that there are 'there are a number of separable components of SWB: life satisfaction (global judgments of one's life), satisfaction with important domains (e.g., work satisfaction), positive affect (experiencing many pleasant emotions and moods), and low levels of negative affect (experiencing few unpleasant emotions and moods)'. To this the concept of Eudaimonia could be added (see below).

[78] Note however that the data is drawn from an online panel and cannot be said to be representative of the MVMA population as a whole, including in terms of income distribution.

different types of social capital-defined groups, and so to observe whether some social groups show a higher or a lower sensitivity to air pollution than the average.

Four SWB questions were collected, with answers on a 1 to 10 point scale, from 'not at all' to 'completely' (Hicks et al., 2013)[79]:

1. SWB1 (life satisfaction): overall, how satisfied are you with your life nowadays?
2. SWB2 (Eudaimonia[80]): overall, to what extent do you feel the things you do in your life are worthwhile?
3. SWB3 (happiness positive affect[81]): overall, how happy did you feel yesterday?
4. SWB4 (anxiousness negative affect): overall, how anxious did you feel yesterday?

The analysis of the relationship between SWB and air pollution (controlling for other covariates) is done using an ordered probit model. The results show that 1) there is limited evidence of a relationship between O3 and SWB in the data (a caveat in the analysis is that the PM10 and PM2.5 data for the period captured by the data is generally at the lowest end of their yearly distributions); 2) income is generally not found to be associated with SWB in the dataset; 3) several social capital measures are found to be strongly and consistently associated with SWB. Given the SWB data constraints the analysis is considered to be exploratory, aiming to offer support for future research in this area[82].

1. Literature review

Over the past decade a few papers were published on the relationship of air quality with SWB. The essential motivation behind these papers is the same as with the rest of the SWB literature: there

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[79] These are questions used by the UK's Office for National Statistics in various surveys to track subjective wellbeing.

[80] 'Eudaimonia' is a Greek term that does not have a direct translation into English, but refers to living a fulfilling life. It is often translated as 'happiness', but has been distinguished from it, as happiness can be seen to be determined by hedonic processes, whereas Eudaimonia relates to 'meaning'. The term is defined in Ryan et al. (2008) as 'living a complete human life, or the realization of valued human potentials'.

[81] 'Affect' is a psychological term to describe an individual's subjective emotions. The positive and negative affects here measure short-term experiences. Separate measures for each are recommended on the basis that the literature has found that positive and negative affects display different properties and are thus not suitable for aggregation: whereas positive affects tend to be highly correlated, negative affects are often not (e.g. someone may feel anxious, but not angry, envious, or jealous; Kahneman et al., 1999; Dolan et al., 2011).

[82] Mexico City has good conditions for future research on SWB and air pollution in a developing country context, as it operates a comprehensive and good quality air pollution monitoring network. It was not possible to obtain better temporal coverage (beyond the four months period considered) within the constraints of the rest of the research, in particular for PM10 and PM2.5.

may be dimensions of individual utility that are not sufficiently captured by income-related measures. Some of these papers have been based on cross-country comparisons, and found relationships between pollution and SWB to be statistically significant (Di Tella & MacCulloch, 2008; Welsch, 2006), but it has been pointed out that this analysis loses intra-country variability in the data due to aggregation, and leads to comparisons between potentially culturally distinct groups that may affect the nature of the data (for example, different cultures may have different interpretations of what it means to be 'happy', or have different 'baseline' responses to such questions).

More recently papers focusing on specific regions or countries have started to be published. MacKerron & Mourato (2009), using a high level of geographic disaggregation and an ordered probit model, find a negative association between nitrogen oxide concentrations and the 'life satisfaction' variable (i.e. SWB1) in London, U.K. They find a very high monetary value for marginal changes to nitrogen oxide concentration levels, which is described as not realistic but in line with similarly high monetary values in other efforts to monetise other non-market goods using the SWB method. Luechinger (2009), using an IV approach with the timing of installation of air pollution filters in power plants as an instrument, finds a statistically significant relationship between instrumented air pollution (sulphur dioxide) and self-reported SWB for German regions (as in MacKerron & Mourato for SWB1). As before, the associated monetary trade-offs between air pollution and income are deemed to be high. Levinson (2012) considers various pollutants, including daily PM10 and O3 concentrations, at U.S.A. county level. He too finds a statistically significant relationship with SWB using different econometric specifications, including an ordered probit model (using a question that he highlights doesn't clearly distinguish affect-type responses from longer-term life satisfaction and Eudaimonia) and very high WTP values for marginal reductions in PM10 concentrations (but not for some other pollutants, including O3; having a wide geographical coverage seems to drive some of the insignificant results found, which are contrasted with the Luechinger (2009) findings, where the sampling focused on people in the vicinity of power plants specifically).

Overall the literature indicates that where a statistically significant relationship is found it tends to imply a WTP value that is much higher than other estimates derived in the literature for marginal changes in air pollution (namely using hedonic pricing methods). Also, the selection of the sample is important for validating claims of association between air pollution and SWB for the broader population (or, conversely, limitations in representativeness of the sample should be acknowledged). Also, while some pollutants do register an association with SWB, others do not, with some indication that this may be due to the perceptibility of the pollutant (i.e., whether it is visible, whether it causes short-term physical reactions, etc.). The three pollutants considered here (PM10, PM25, O3) fit this perceptibility criterion at different levels, with PM10 being likely the most salient to the public (it has a longer history of reporting, it is more widely publicised, often being the headline pollutant reported on, and it can affect visibility in the city).

The literature review resulted in only one study on the relationship between SWB and air pollution in a developing country context: Zhang et al. (2015) find that air pollution has statistically significant relationship with a (short-term) positive happiness affect (similar to SWB3), but not with a life-satisfaction measure (SWB1), using data covering several geographical locations in China. Interestingly, they also include a measure of mental health (for depressive symptoms), which is found to be significantly linked to air pollution variation. The data structure is a panel, which allows for individual respondent fixed effects estimation.

One issue of concern in the air pollution and SWB literature is the presence of endogeneity when aiming to make causal inference: it is not possible to assert whether higher pollution levels lead to lower SWB, or whether those with low SWB are more sensitive to air pollution with standard econometric analysis on a cross-sectional dataset such as the one used here. There may be unobserved individual characteristics that drive this process and that are not possible to remove from the analysis (unless there is a panel structure to the data, but then only to the extent these don't vary over time, or a valid external instrument is found). The existing literature has only considered causality to a limited extent (e.g., Zhang et al., 2015; Luechinger, 2009).

2. Methodology

The standard analysis uses an ordered probit regression. The type of model used in the literature can be described as (adapted from Menz, 2011):

$$SWB_{its} = \beta_0 + \beta_1.income + \beta_2.pollutant + \sum_{k=3}^{n} \beta_k.X_{kits} + \delta_i + \eta_t + \rho_s + \varepsilon_{its}$$

Where SWB stands for subjective wellbeing, X_k represents a vector of explanatory variables besides income and the pollutant (socio-economic variables; health status variables; social capital variables; engagement with the survey variables; acceptance and understanding of the survey parameters variables; distance to the historic centre and the business district variables). Subscripts i t and s refer to boroughs within the MVMA, the time when the survey was performed, and the survey sponsor logos (see chapter 3), respectively, with δ, η and ρ refering to dummy variables for the borough where the respondent lives; the day of the week, month and week of the month when the survey was conducted; and the survey sponsor presented to the respondent.

One of the questions for the implementation of the procedure is that of variable selection. There are many variables in the current dataset that can be considered for inclusion in the model. In empirical studies, a statistically significant positive relationship between SWB and income has often been reported (Diener et al., 2013; Dittmar et al., 2014; Stevenson & Wolfers, 2013). The nature of the SWB and income relationship can vary between countries (Steptoe et al., 2015), changes in nature for measurement at the individual or societal level (at an individual level within a country a person's position in relation to others matters, at an aggregate social level this effect is netted out in between-country comparisons[83]; Clark et al., 2008), for different types of 'personality types' (income being associated more strongly with SWB for those displaying higher levels of neuroticism; Soto & Luhmann, 2012). Also, Kahneman & Deaton (2010) find that increased income is positively related to the 'life satisfaction' and 'Eudaimonia' type variables that are used in this chapter, but not to the short-term affect type variables.

Another variable selection issue, given the available data, is whether to include the social capital variables in the starting-point long list, in addition to the socio-economic and health variables. The inclusion of social capital-type variables is not systematic in the literature, but there are several papers that consider the relationship between social capital and SWB specifically and find it to be positive (a review in Dolan et al., 2008).

The dataset does not include other variables that may have strong associations with SWB. Most notably it is missing a measure of mental health. In a recent working paper Flèche & Layard (2015) show that mental health status is a stronger predictor of SWB than income and physical health (while also demonstrating that mental health and SWB are not measuring the same essential concept), and make a call for a greater role for mental health issues to be included in research on SWB and in public policy decisions aimed at promoting social welfare.

The full list of covariates includes then the socio-economic and self-reported health status variables, as well as the social capital variables. In addition the list includes the 'survey sponsor' variables (collected for the chapter 3 analysis) and the variables measuring the respondent's engagement with

[83] Which is a possible explanation for Easterlin's Paradox (Easterlin, 1974), whereby it was observed that reported happiness didn't seem to vary on the basis of income between countries (even if it did within a country).

the survey, as these were in some cases found to affect responses to the questionnaire in the previous chapters; as well as variables for different days of the week, different weeks of the month, and different months, as these may capture time-specific information of relevance to the SWB measures; and variables that capture distance to the historical centre and the business centre of Mexico City (distance to the city centre was found to be negatively correlated with SWB in MacKerron & Mourato, 2009).

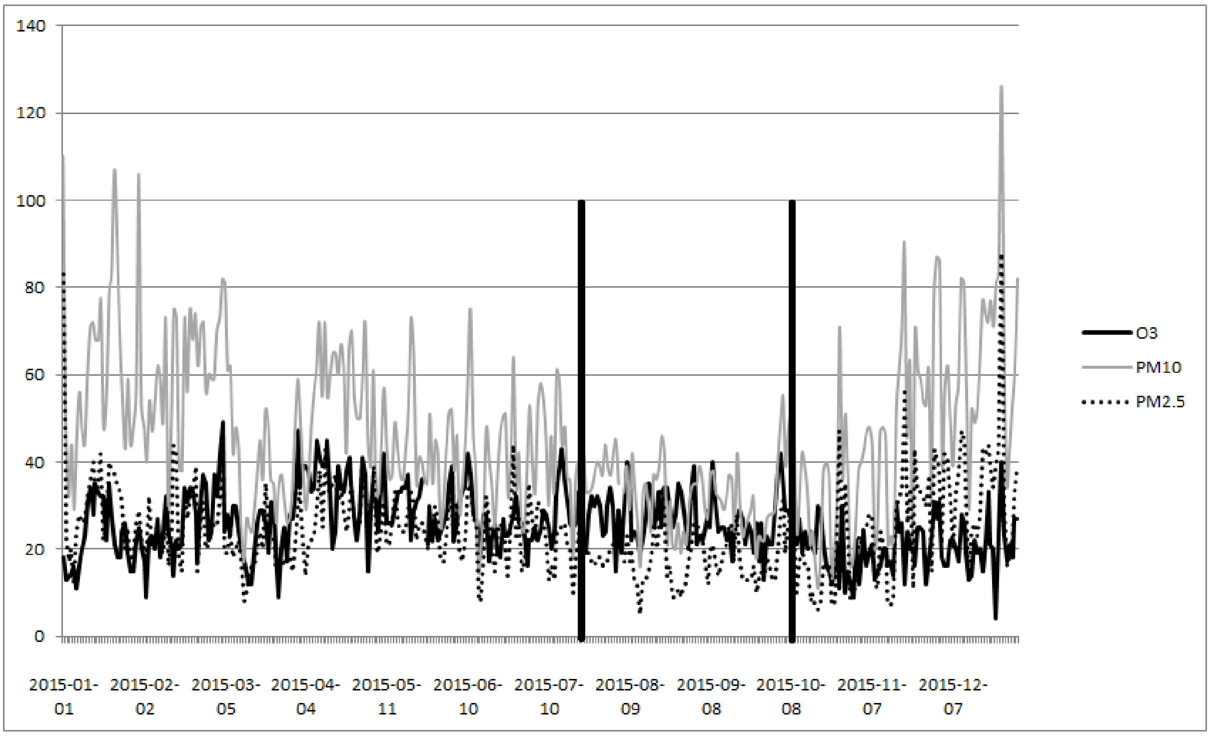
3. Data

The geographical focus of the analysis is the MVMA. SWB data were collected as part of the online survey used in chapters 3 and 4, with the data collection taking place between 24 July and 13 October 2015 (no data collection in August) and the survey instrument being sent out randomly to successive batches of respondents in the panel (within the 40-50 age range). Residential postcode information was requested as part of the survey to facilitate geocoding and was checked against the postcodes provided by the respondents to the surveying company for consistency. Socio-economic data, self-reported health data, and social capital data were also collected as part of the survey, as is described in chapters 2, 3 and 4.

Georeferenced SWB data were matched with interpolated air pollution data. The air quality data are sourced from the RAMA network, described in chapter 5, using daily average readings (for the same days for which the SWB data was collected, i.e. in the 24 July to 13 October 2015 period). The daily readings data are interpolated for each day separately and assigned to the LS data by date and geolocation (to AGEB centroids). There was a large-scale restructuring of the air pollution network in 2011, resulting in a more extensive geographical coverage of air pollution in the MVMA, with also some stations closing and new ones starting operation (Secretaria del Medio Ambiente del Distrito Federal, 2011), which allows for a broader geographical coverage for the interpolation of PM10, PM2.5 and O3 readings at station level than was possible in the chapter 5. Still, the geographical coverage for PM2.5 continues to be less than for PM10 and O3. PM10 and O3 can now be interpolated over the same geographical extent (see figure 7).

One important limitation of the data is it representativeness in relation to the yearly distribution of the three pollutants (see figure 6), even if data collection took place over a four month period. PM10 and PM2.5 in particular register relatively low values in the period considered. In addition there is a possible lack of sufficient variability for the econometric analysis to register a statistical signal (a similar problem was encountered by (MacKerron & Mourato, 2009, but in their case most of their values were almost all relatively 'high', this lack of variation may explain why they find no effect for PM10 in their data). This issue is considered again in the data analysis section.

Figure 6 – Distribution of daily averages in 2015, O3, PM10 and PM2.5



Note: dates between which data was collected are highlighted by the two vertical black bars (24/07/2015 to 13/10/2015). Monitoring station: San Agustin.

Tables 27 to 29 list the descriptive statistics for the three pollutants considered. The most noticeable differences (on sample size, income, and distance to business and historic centres) are between PM2.5 and the other two pollutants, which are due to the narrower geographic coverage of PM2.5 by the MVMA's RAMA. Also of note is the temporal distribution of the data, which is skewed in terms of day (towards Sunday, Monday, Tuesday and Wednesday), week of the month (third and fourth week), and month (September).

Figure 8 shows the frequency distribution of the SWB measures, which follow a similar patter to that generally found in the SWB literature: skewed to the right on life satisfaction, Eudaimonia, and happiness; and skewed to the left on anxiety (for anxiety the scale is 'reversed', in the sense that higher values represent respondents being worse off by reporting to having recently felt high levels of anxiety)[84].

4. Analysis

The social capital variables were first reduced in dimension by means of PCA (see Annex 6.1). All of the four types of social capital could be reduced to a single significant component (using the rule of keeping only components with an Eigenvalue higher than one), except for institutional trust. As such the institutional trust variables were kept in the same format as in the previous chapter[85]. The analysis was run on an ordered probit regression (the standard regression with cross-sectional data in the literature).

The ordered probit analysis is run stepwise, dropping variables that have a significance level below 10%, with the least significant being dropped first (pollutant and income are kept regardless of significance in the regressions as they are of the most interest in the analysis). Several measures of income were tested against theoretical expectations and household income had generally the best performance[86]. To maintain a measure of family size in the regression a dummy variable for those with at least one child below age 18 was added. The remaining variables include other socio-economic and health characteristics; social capital measures; the survey sponsor logo used; variables capturing participant engagement with the survey; variables capturing understanding and acceptance of the questionnaire premises; and time (day of the week, week of the month, and month) and location (borough within MVMA and distance to the historical centre and business district). The regressions were based on samples A and C, using the data filters defined in chapter 2[87], and use robust standard errors[88].

PM10 and O3 results are generally similar in terms of the coefficients on the control variables, with the exception of air pollution (the coefficients in the probit model do not have a straightforward

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[84] The dependent variables were also tested for spatial dependence, using Moran's I (see chapter 5 for a discussion of the implementation in Stata). The tests resulted in a rejection of the hypothesis of spatial dependence in the SWB data (see Annex 6.3).

[85] Namely trust in: government ministries; NGOs; universities; politics, law, and order institutions; the press; large companies; and the church.

[86] Personal income, household income and household income per household member (and their logarithmic forms) were also tested.

[87] Sample A: respondent gets both probability tests wrong; Sample C: same as sample A or, in addition, respondent states they do not understand probability well or give an illogical response to the WTP questions.

[88] Sample C is generally considered more reliable as it sets a higher standard for response validity, while keeping a large number of observations for the analysis.

interpretation), whereas PM2.5 results are not. This is due to the different geographical coverage of PM2.5 in relation to the other two pollutants, which significantly affects the sample of which the regressions are run. The analysis finds little evidence of air pollution affecting SWB in the MVMA, with only the exception of O3 and SWB3 (happiness)[89], which is significant at the 10% level. The coefficients on the air pollution variables are generally of the expected sign for PM10 and O3 but not for PM2.5 (see tables 30 to 33). Otherwise the expectation was that if a significant relationship between any of the pollutant variables and SWB was to be found it would have been for the PM10 variable: PM10 is typically more salient than other pollutants as it is more visible and PM10 levels tend to be more publicised. This was in fact the result in chapter 5, where PM10 and PM2.5 ambient concentrations were found to affect rental prices in the housing market, whereas O3 did not.

A likely explanation for the lack of significance is the relatively low levels of pollution in the period covered by the data (July to October), in particular for PM10 and PM2.5. Data covering also months with higher atmospheric concentrations might have resulted in more of a statistical signal being picked up in the data. With this caveat in mind it is then not possible to draw the general conclusion that air quality levels are not associated with SWB in the MVMA from this analysis. Rather, within the constraints of the data, there is some limited evidence of a relationship (for O3).

To investigate further whether a statistically significant relationship between air pollution and SWB can be found for particular social subgroups, even if on aggregate there is little evidence, the data was partitioned into seven types based on income (highest and lowest 20% incomes) and social capital type (according to the social capital groupings defined in chapter 4: high social capital; low social capital; traditionalist types; and 'miniaturisation of society' types). It is possible that even with relatively low background levels of pollution some social subgroups may be more sensitive to environmental conditions and still reveal a SWB association with variations in pollution. Results for this disaggregation are shown in annex 6.4.

A negative association between O3 and SWB3 (happiness) is also found for the high income group (5% significance, sample C), but not for the low income group[90]. *Positive* associations with PM2.5 and PM10 are also found in a few cases for both high and low income groups. It may be the case that despite the extensive list of controls an omitted variable problem persists (i.e. the positive coefficients may indicate that PM2.5 and PM10 are proxying for other variables).

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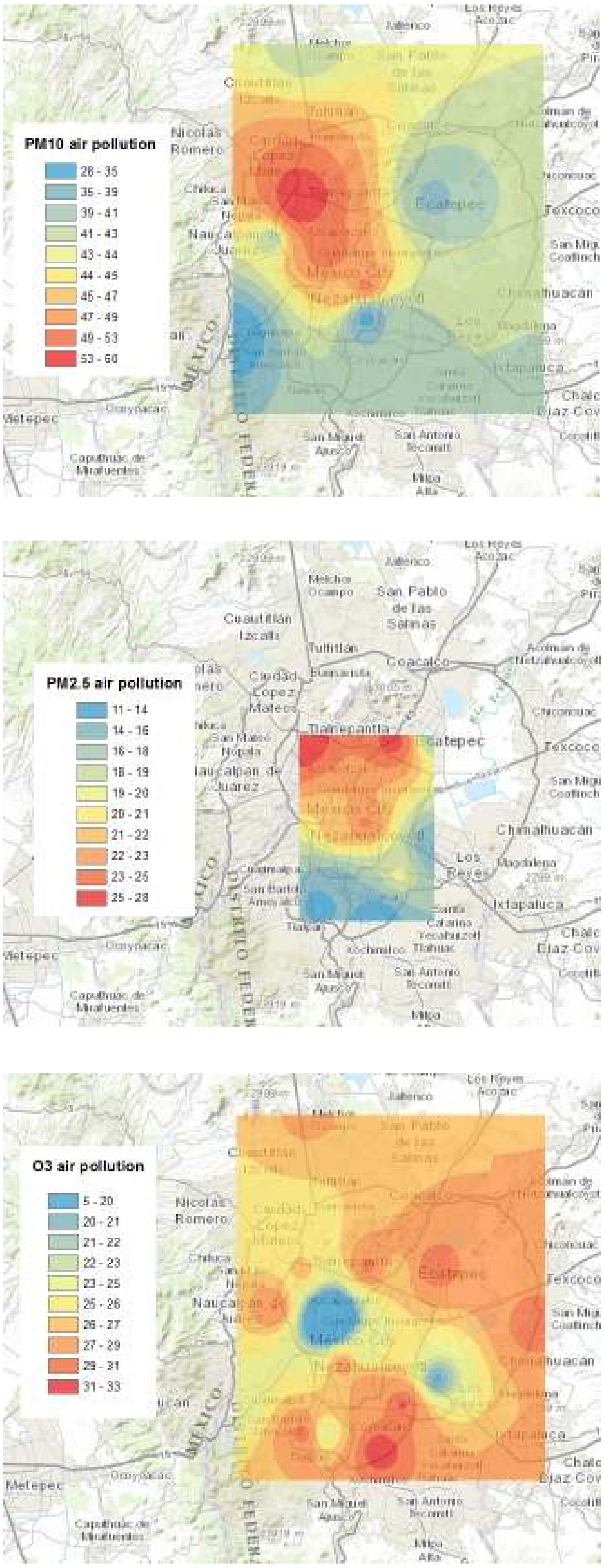
[89] Contrast this to chapter 5, where no effect was found for O3 and rental values.

[90] Top 20% and bottom 20% household income.

Figure 7 – Geographical coverage of the extrapolated data (PM10, PM2.5 and O3)



Source: maps made using ArcMap 10.1. Inverse Distance Weighting interpolation, based on daily average concentrations on the 9th of September of 2015 as measured at monitoring stations. PM10 and PM2.5 in µg/m³; O3 in ppb.

Table 28 – Descriptive statistics for PM10, PM2.5 and O3 (cont.)

	PM10		PM25		O3	
	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.
Age (years)	43.96	2.97	43.94	2.92	43.96	2.97
Female (=1)	0.48	0.50	0.48	0.50	0.48	0.50
Household pc income (MXN, log)	72,114	110,454	75,153	117,226	72,229	109,809
Married (=1)	0.58	0.49	0.57	0.50	0.58	0.49
University education (=1)	0.60	0.49	0.61	0.49	0.61	0.49
Unemployed (=1)	0.05	0.22	0.05	0.22	0.05	0.22
Very religious (=1)	0.20	0.40	0.20	0.40	0.20	0.40
Smoker (=1)	0.33	0.47	0.33	0.47	0.33	0.47
Own insurance (=1)	0.21	0.40	0.20	0.40	0.21	0.40
No insurance (=1)	0.18	0.39	0.19	0.39	0.18	0.39
Heart disease (=1)	0.03	0.16	0.03	0.16	0.02	0.16
Bronchitis (=1)	0.04	0.20	0.05	0.21	0.04	0.20
Asthma (=1)	0.04	0.19	0.04	0.20	0.04	0.19
High blood pressure (=1)	0.14	0.34	0.12	0.33	0.13	0.34
Cancer (=1)	0.02	0.14	0.02	0.15	0.02	0.14
Hospital admission (=1)	0.04	0.20	0.04	0.20	0.04	0.20
Emergencies admission (=1)	0.06	0.24	0.07	0.25	0.06	0.24
Mexican university logo (=1)	0.14	0.35	0.15	0.36	0.14	0.35
Foreign university logo (=1)	0.12	0.33	0.12	0.33	0.12	0.33
Environment Ministry logo (=1)	0.13	0.33	0.13	0.34	0.13	0.33
Health Ministry logo (=1)	0.13	0.33	0.11	0.32	0.13	0.33
Blue Bank logo (=1)	0.14	0.34	0.14	0.35	0.14	0.34
Red Bank logo (=1)	0.12	0.33	0.12	0.32	0.12	0.33
Spanish Bank logo (=1)	0.11	0.31	0.11	0.31	0.11	0.31
Time on WTP5, over 25 secs (=1)	0.76	0.43	0.75	0.43	0.76	0.43
Time to completition (mins)	35.30	60.65	34.67	57.30	35.16	60.10
Doubted product would work (=1)	0.30	0.46	0.29	0.45	0.30	0.46
Risk doesn't apply to them (=1)	0.32	0.47	0.32	0.46	0.32	0.47
Didn't understand payment timing (=1)	0.12	0.32	0.12	0.33	0.12	0.32
Didn't think about ability to pay (=1)	0.13	0.33	0.13	0.34	0.13	0.33
Thought own risk of dying was higher (=1)	0.04	0.20	0.04	0.20	0.04	0.20
Thought about other benefits (=1)	0.35	0.48	0.35	0.48	0.35	0.48
Thought there would be side effects (=1)	0.26	0.44	0.25	0.43	0.26	0.44
Distance to business district (metres)	15,347	8,906	12,860	5,418	15,372	8,905
Distance to historic centre (metres)	12,187	6,908	7,881	3,528	12,186	6,914
Number of observations	1,743		1,042		1,777	

Note: based on sample C cleaning criteria (see chapter 2). (=1) indicates dummy variable.

Table 29 - Descriptive statistics for the PM10, PM2.5 and O3 - social capital (cont.)

	PM10		PM25		O3	
	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.
1 Socialisation						
Socialising with friends (=1)	0.47	0.50	0.49	0.50	0.48	0.50
Socialising with co-workers (=1)	0.34	0.47	0.34	0.47	0.34	0.47
Socialising with neighbours (=1)	0.13	0.33	0.13	0.33	0.13	0.33
2 Support from others						
Borrow month's wage (=1)	0.40	0.49	0.43	0.49	0.41	0.49
Help with illness (=1)	0.53	0.50	0.54	0.50	0.53	0.50
Help find a job (=1)	0.55	0.50	0.57	0.50	0.55	0.50
Help to go to visit a doctor (=1)	0.76	0.43	0.77	0.42	0.76	0.43
Help to improve neighbourhood (=1)	0.40	0.49	0.41	0.49	0.39	0.49
3 Civic engagement						
Sports club (=1)	0.17	0.38	0.18	0.39	0.18	0.38
Political party (=1)	0.05	0.22	0.05	0.22	0.05	0.22
NGO (=1)	0.06	0.23	0.05	0.22	0.06	0.23
Cultural or social club (=1)	0.11	0.31	0.12	0.32	0.11	0.32
Religious organisation (=1)	0.23	0.42	0.22	0.41	0.23	0.42
Neighbourhood group (=1)	0.14	0.34	0.12	0.32	0.14	0.34
Parents or alumni association (=1)	0.16	0.36	0.16	0.36	0.16	0.36
Volunteering (=1)	0.20	0.40	0.19	0.39	0.20	0.40
4 Trust in institutions						
Health Ministry (=1)	0.38	0.49	0.38	0.49	0.38	0.49
Environment Ministry (=1)	0.35	0.48	0.36	0.48	0.35	0.48
Environmental NGOs (=1)	0.55	0.50	0.54	0.50	0.55	0.50
Humanitarian NGOs (=1)	0.58	0.49	0.56	0.50	0.58	0.49
The Federal Government (=1)	0.13	0.34	0.13	0.34	0.13	0.34
Political parties (=1)	0.05	0.21	0.05	0.21	0.05	0.21
The police (=1)	0.10	0.30	0.11	0.32	0.10	0.30
Law courts (=1)	0.16	0.36	0.17	0.37	0.16	0.36
Mexican universities (=1)	0.84	0.36	0.85	0.36	0.84	0.37
U.S. universities (=1)	0.75	0.43	0.75	0.43	0.75	0.43
The Press (=1)	0.26	0.44	0.26	0.44	0.26	0.44
Large companies (=1)	0.42	0.49	0.40	0.49	0.42	0.49
The Church (=1)	0.43	0.50	0.42	0.49	0.44	0.50
Generalised trust (=1)	0.64	0.48	0.65	0.48	0.64	0.48
High social capital (=1)	0.26	0.44	0.25	0.44	0.27	0.44
Low social capital (=1)	0.22	0.41	0.20	0.40	0.21	0.41
Traditionalists (=1)	0.28	0.45	0.30	0.46	0.28	0.45
Miniaturisation of community (=1)	0.24	0.42	0.24	0.43	0.24	0.42
Number of observations	1,743		1,042		1,777	

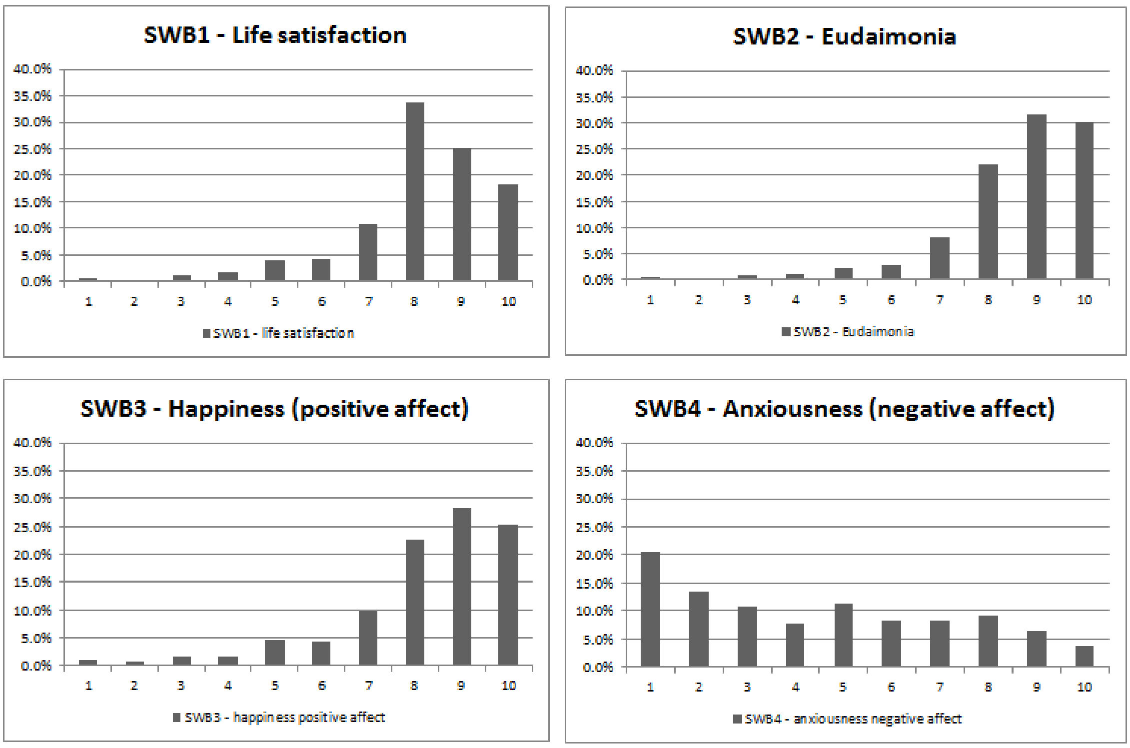
Note: based on sample C cleaning criteria (see chapter 2). (=1) indicates dummy variable

Table 30 - Descriptive statistics for the PM10, PM2.5 and O3 - time dummies

	PM10		PM25		O3	
	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.
Monday (=1)	0.27	0.45	0.30	0.46	0.29	0.45
Tuesday (=1)	0.20	0.40	0.18	0.39	0.20	0.40
Wednesday (=1)	0.16	0.37	0.17	0.38	0.16	0.37
Thursday (=1)	0.09	0.29	0.09	0.29	0.09	0.29
Friday (=1)	0.06	0.24	0.06	0.23	0.06	0.23
Saturday (=1)	0.03	0.17	0.03	0.16	0.03	0.17
Sunday (=1)	0.17	0.38	0.17	0.37	0.17	0.38
1st week of the month (=1)	0.06	0.24	0.07	0.26	0.06	0.24
2nd week of the month (=1)	0.14	0.35	0.17	0.38	0.16	0.37
3rd week of the month (=1)	0.39	0.49	0.35	0.48	0.38	0.49
4th week of the month (=1)	0.40	0.49	0.40	0.49	0.39	0.49
July (=1)	0.15	0.36	0.14	0.34	0.15	0.35
September (=1)	0.78	0.41	0.79	0.41	0.79	0.41
October (=1)	0.07	0.25	0.08	0.26	0.07	0.25
Number of observations	1,743		1,042		1,777	

Note: based on sample C cleaning criteria (see chapter 2); (=1) indicates a dummy variable.

Figure 8 – Distribution of subjective wellbeing



Note: sample C quality filter. 1=not at all, 10=completely. SWB1: how satisfied are you with your life nowadays?; SWB2: overall, to what extent do you feel the things you do in your life are worthwhile?; SWB3: overall, how happy did you feel yesterday?; SWB4: overall, how anxious did you feel yesterday?

Significant negative relationships were also found for O3 and: SWB2 (Eudaimonia) and SWB3 for the high social capital group (5% and 10% significance, sample C); SWB3 for the low social capital group (10%, samples A and C); and SWB1 (life satisfaction; 5% samples A and C) and SWB2 (5%, sample A but not sample C) for the 'miniaturisation of community' group [91]. No significant relationship was found for the traditionalist group.

The PM10 and PM2.5 variables in some instances have a significant expected sign but in others have a significant unexpected sign in the income and social capital subgroups (in most cases no statistically significant relationship was found). This may be due to the relatively low seasonal pollution that the data represents, which produces a relatively weak statistical signal for pollution. As such the PM10 and PM2.5 data do not offer conclusive generalizable evidence of their relationship to the SWB measures considered, and more research would be needed to make more definitive statements.

Income was generally not significant in the full regression for the sample. Income was significant for SWB1 and SWB2 for the high income group; for the high social capital group (for PM2.5 only); and in some instances for SWB2 and SWB3 for the traditionalist group. Income had an unexpected sign for the low income group and a similar result was found for the low social capital group for SWB4 (higher income being associated with higher self-reported anxiety), and for the 'miniaturisation of community' group (PM10 only). A possible interpretation is that those with higher incomes in these groups may trade off income for leisure time at a 'high' rate, which has a negative effect on SWB. The non-significance of income in the full regression results seems to be masking these countervailing effects for the different subjective wellbeing subgroups. Literature reviews on the relationship between subjective wellbeing and income have often found a small, but significant, relationship (Dolan et al., 2008; Ferrer-i-Carbonell & Frijters, 2004; Blanchflower & Oswald, 2004). However, Lucas & Schimmack (2009) note that a finer interpretation of the data can be warranted in these studies. Their findings show the relationship to be larger and significant between different socio-economic groups when the data are disaggregated by income level.

For the other socio-economic effects the most consistent findings in the full regression in terms of statistical significance were that being married has a positive association with SWB1 (life satisfaction) and SWB3 (happiness), but has no significant relationship with SWB2 (Eudaimonia) and SWB4

[91] A negative relationship was also found between O3 and SWB4 (anxiety, short term affect) for sample A. The scale for anxiety is 'reversed' in the sense that higher values indicate less wellbeing on this measure.

(anxiety), and being unemployed has a negative association with SWB1 and SWB3, but not with SWB2 and SWB4. Describing oneself as 'very religious' was associated with increased life satisfaction, increased Eudaimonia and reduced anxiety but showed no relation with (short-term) happiness (SWB3). Having a university education showed a significant positive association with Eudaimonia only. Owning a private insurance policy was associated with increased life satisfaction. These results varied in terms of significance and in some cases in terms of direction of the relationship when considering instead the different socio-economic and social capital subgroups. Several of the health dummies were also significant and with the expected sign (existence of illness having a negative association for SWB1, SWB2, and SWB3, and positive for SWB4).

Table 31 – Socio-economic and health variables - ordered probit regression results, SWB1 – Life satisfaction

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.06	0.11	-0.08	0.12								
PM2.5 (log)					0.01	0.2	-0.09	0.2				
O3 (log)									-0.07	0.14	-0.11	0.15
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.00	0.00	0.00	0.00 *	0.0	0.00	0.0	0.00	0.00	0.00	0.00
Married (=1)	0.23 ***	0.06	0.22 ***	0.07	0.14 *	0.1			0.24 ***	0.06	0.22 ***	0.07
University education (=1)												
Unemployed (=1)	-0.66 ***	0.15	-0.86 ***	0.17	-0.34 *	0.2	-0.53 **	0.2	-0.65 ***	0.15	-0.85 ***	0.17
Very religious (=1)	0.12 *	0.07	0.16 *	0.09	0.16 *	0.1			0.15 **	0.07	0.18 **	0.09
Smoker (=1)			-0.12 *	0.07			-0.19 **	0.1			-0.12 *	0.07
Own insurance (=1)	0.15 **	0.07	0.17 *	0.08					0.13 *	0.07	0.18 **	0.08
No insurance (=1)	-0.14 *	0.08							-0.15 *	0.08	0.09 ***	0.03
Has children under 18 (=1)												
Heart disease (=1)	-0.38 **	0.18			-0.61 ***	0.2	-0.64 ***	0.2	-0.37 **	0.18	-0.37 **	0.19
Bronchitis (=1)					-0.39 **	0.2						
Asthma (=1)	-0.35 ***	0.13	-0.37 *	0.17					-0.35 ***	0.13	-0.37 **	0.17
High blood pressure (=1)			-0.19 **	0.09								
Cancer (=1)												
Hospital admission (=1)												
Emergencies admission (=1)												

Table 32 – Socio-economic and health variables - ordered probit regression results, SWB2 – Eudaimonia

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.03	0.12	-0.11	0.13								
PM2.5 (log)					0.23	0.19	0.13	0.22				
O3 (log)									-0.10	0.14	-0.13	0.15
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.00	0.00	0.00	0.00 *	0.00	0.00 **	0.00	0.00	0.00	0.00	0.00
Married (=1)												
University education (=1)	0.21 ***	0.06	0.23 ***	0.07					0.22 ***	0.06	0.24 ***	0.07
Unemployed (=1)									-0.11 *	0.06		
Very religious (=1)	-0.51 ***	0.15	-0.56 ***	0.17	-0.35 **	0.17	-0.45 *	0.23	-0.50 ***	0.15	-0.58 ***	0.17
Smoker (=1)	0.16 **	0.08					0.20 *	0.11	0.16 **	0.08	0.16 *	0.09
Own insurance (=1)												
No insurance (=1)	0.18 **	0.07	0.24 ***	0.08	0.17 *	0.09	0.25 **	0.11	0.19 ***	0.07	0.22 ***	0.08
Has children under 18 (=1)												
Heart disease (=1)			-0.40 **	0.20							-0.37 *	0.21
Bronchitis (=1)	-0.27 **	0.12			-0.27 *	0.16			-0.26 **	0.12		
Asthma (=1)	-0.43 ***	0.13	-0.48 ***	0.16	-0.31 *	0.17	-0.36 *	0.21	-0.42 ***	0.13	-0.46 ***	0.16
High blood pressure (=1)												
Cancer (=1)			0.42 *	0.24								
Hospital admission (=1)												
Emergencies admission (=1)												

Table 33 – Socio-economic and health variables - ordered probit regression results, SWB3 – happiness (positive affect)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	0.02	0.12	-0.09	0.13								
PM2.5 (log)					0.06	0.16	0.06	0.20				
O3 (log)									-0.24 *	0.15	-0.26 *	0.16
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Married (=1)	0.18 ***	0.06	0.17 ***	0.07					0.18 ***	0.06	0.18 ***	0.06
University education (=1)	-0.62 ***	0.13	-0.72 ***	0.16								
Unemployed (=1)					-0.31 *	0.16	-0.40 *	0.22	-0.61 ***	0.14	-0.74 ***	0.16
Very religious (=1)												
Smoker (=1)												
Own insurance (=1)												
No insurance (=1)												
Has children under 18 (=1)					0.12 *	0.07						
Heart disease (=1)												
Bronchitis (=1)												
Asthma (=1)	-0.33 **	0.16	-0.48 **	0.19					-0.35 **	0.15	-0.49 **	0.19
High blood pressure (=1)	-0.15 *	0.09	-0.17 *	0.10								
Cancer (=1)			0.48 **	0.22							0.39 *	0.20
Hospital admission (=1)												
Emergencies admission (=1)												

Table 34 – Socio-economic and health variables - ordered probit regression results, SWB4 – Anxiety (negative affect)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.09	0.11	-0.12	0.13								
PM2.5 (log)					0.3	0.2	0.09	0.17				
O3 (log)									-0.04	0.14	0.08	0.15
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 *	0.00	0.00	0.00
Married (=1)												
University education (=1)												
Unemployed (=1)												
Very religious (=1)	-0.28 ***	0.07	-0.15 *	0.09	-0.32 ***	0.09	-0.23 **	0.11	-0.31 ***	0.07	-0.19 **	0.09
Smoker (=1)												
Own insurance (=1)												
No insurance (=1)												
Has children under 18 (=1)												
Heart disease (=1)												
Bronchitis (=1)	0.28 **	0.13							0.29 **	0.13	0.29 *	0.17
Asthma (=1)	0.53 ***	0.14	0.42 ***	0.16	0.44 **	0.18			0.56 ***	0.14	0.39 **	0.16
High blood pressure (=1)	0.14 *	0.08	0.19 **	0.09	0.23 **	0.11	0.30 **	0.12			0.16 *	0.09
Cancer (=1)												
Hospital admission (=1)												
Emergencies admission (=1)							0.36 **	0.16				

Note: for anxiety there is a reverse order scale (lower values are 'better' as they indicate lower anxiety)

Of the remaining controls the most relevant and consistent outcomes relate to the social capital variables, where it was found that socialising with others and being able to rely on support from others when in need was generally found to be significantly related to increased life satisfaction (SWB1), Eudaimonia (SWB2), and happiness (SWB3). Socialising however was not related in these terms with reduced anxiety (SWB4), but being able to rely on the support of others was. Finally, for the generalised trust measure the data showed that those who stated most other people could be trusted also tended to report lower levels of SWB. The vast majority of the literature that has considered the association between generalised trust and SWB has found these to be positively associated. A similar result to the one in this chapter has been found in some of the literature before, however, and a possible explanation that has been offered is that people with a high propensity to trust may also be more frequently disappointed in others (‘cheated’), which may then affect their SWB levels (Mironova, 2015, considering the case of Russia) .

5. Conclusions

The results of the analysis show mixed evidence of an impact of air pollution concentrations on SWB in the MVMA for three pollutants considered (PM10, PM2.5, O3). The only case where a significant statistical relationship was found was that of O3 and a measure of happiness (short-term affect) in the full regression analysis. When the data was disaggregated this effect was present in the high income group (but not the low income group) and in the high and low social capital groups (but not in the ‘miniaturisation of community’ and traditionalist groups). As such, different groups in the MVMA show different patterns of association between air quality and SWB.

One important limitation of the analysis is the timeframe covered by the data. The data collection took place between July and October 2015, which are months of relatively low air pollution for PM10 and PM2.5 in particular. This may have affected the results as the analysis is limited to readings in the lower bound of the air pollution distribution over the year, in particular for these two pollutants. As populations become habituated to a certain background air pollution at their locations, even when that background can be considered relatively high by some measures, it is more likely that more noticeable short-term effects of air pollution on SWB will take place only at the higher end of the air pollution distribution. As such the results only allow stating that there is little evidence of a statistically significant relationship between air pollution and SWB in that lower bound of the distribution.

The analysis in this chapter focused only on short-term (same-day) exposure to air pollution, and its possible effects on subjective wellbeing. It is also possible that longer or lagged periods of exposure, or exposure to peaks of pollution, can affect, or affect differently, the various measures of subjective wellbeing considered. This is an area where future analysis of the data available may be usefully expanded to.

There is evidence that acute and chronic exposure to pollution have different effects on physical health outcomes, for example with short-term peaks in pollution leading to higher incidence of asthma attacks, whereas long-term, cumulative exposure can contribute to cardio-vascular complications. These types of physical health complications can work as stressors impacting on mental wellbeing (Møller et al., 1996; Salim, 2014; Moulton & Yang, 2012; Chen & Schwartz, 2009; Guarnieri & Balmes, 2014). Air pollution may affect also affect subjective wellbeing more directly, with some chemicals present in air pollution having damaging effects on the central nervous system, and being associated with the development of a range of psychological disorders (Lehrer et al., 2002; Huurre & Aro, 2002; Hamer et al., 2010).

Mexico City offers a good opportunity to revisit the issue of SWB and air pollution in a developing country context as it has a good air quality monitoring network that can support the analysis. Future research should consider the timing of the data collection to account for the significant seasonality in the pollutant data. Some of the coefficients showed unexpected significant signs, which suggests the presence of omitted variables, even with an extensive set of control variables. Thought should be given to controlling for these through the study design (for example by establishing a panel or using instrumental variables). Following Zhang et al. (2015) it is also recommended that future research includes measures of mental health as control variables, as evidence is emerging that these often have strong statistical relationships with SWB (see also Flèche & Layard, 2015).

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Annexes

Annex 2.1 - Questionnaire

The following questionnaire text is for the example of a 45 year old male (the content of the questionnaire is adjusted for age and gender). The text is the same for all age/gender groups, except where relevant information is altered (e.g. age and gender-specific health information).

40-45 year old male – Questionnaire text

0 Randomiser

Q1 ¿Cuál es su sexo?

- ❍ Masculino (1)
- ❍ Femenino (2)

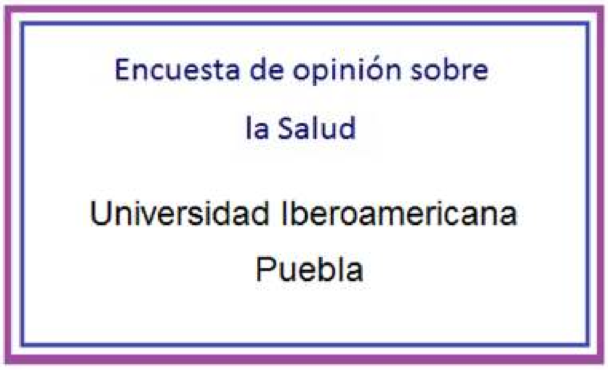
2.2 ¿Cuántos años tiene usted? Escriba su respuesta usando la pantalla y luego presione 'Siguiente' para continuar.

2.3 Usted ha escrito [under 40, over 75] como su edad. ¿Está usted seguro que su edad es correcta?

- ❍ Sí
- ❍ No

2.4 ¿Cuántos años tiene usted? Escriba su respuesta usando la pantalla y luego presione la tecla 'Siguiente' para continuar.

4.1 (intro page example)



4.2 Gracias por haber accedido a ayudarnos en nuestro proyecto de investigación. Este estudio es sobre las acciones que las personas toman para reducir su chance o probabilidad de morir. Nosotros no estamos representando ninguna empresa privada ni estamos tratando de vender algún producto. Estamos muy interesados en su opinión.

4.3 Esperamos que la encuesta sea muy interesante y fácil de utilizar para usted. En la pantalla están las instrucciones que le dirán qué hacer. Sus respuestas son anónimas y confidenciales. Por favor, tome el tiempo necesario para leer con cuidado la información que está en cada pantalla y completar toda la encuesta. ¡Muchas gracias! Para empezar, nos gustaría hacer algunas preguntas sobre usted.

5.1 En comparación con otras personas de su edad, diría que su salud en general es:

❍ Excelente

❍ Muy buena

❍ Buena

❍ Adecuada

❍ Mala

5.2 Sus padres, hermanas o hermanos biológicos ¿han sido diagnosticados alguna vez con…

	Sí	No	No lo sabe
…alguna enfermedad del corazón?	❍	❍	❍
...presión arterial alta?	❍	❍	❍
…asma?	❍	❍	❍
…bronquitis, enfisema, o tos persistente?	❍	❍	❍
…cáncer?	❍	❍	❍

5.3 ¿Tiene usted…

	Sí	No	No lo sabe
…alguna enfermedad del corazón?	❍	❍	❍
...presión arterial alta?	❍	❍	❍
…asma?	❍	❍	❍
…bronquitis, enfisema, o tos persistente?	❍	❍	❍
…cáncer?	❍	❍	❍

5.4 En los últimos 5 años ¿usted ha tenido algún problema del corazón o pulmón por el cual...

	Sí	No	No recuerda
...fue a urgencias?	❍	❍	❍
...tuvo que ser hospitalizado (y que no sea urgencias)?	❍	❍	❍

5.5 En comparación con su estado general de salud de hoy, diría que su salud...

	Mucho mejor	Mejor	La misma	Peor	Mucho peor
...en diez años será	❍	❍	❍	❍	❍
...si usted vive hasta la edad de 75 años será	❍	❍	❍	❍	❍

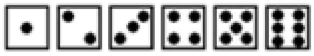
5.6 ¿Hasta qué edad usted creé que vivirá?

- ❍ 40 a 50
- ❍ 51 a 60
- ❍ 61 a 70
- ❍ 71 a 75
- ❍ 76 a 80
- ❍ 81 a 85
- ❍ 86 a 90
- ❍ 91 a 95
- ❍ 96 a 100
- ❍ Más de 100

5.7 ¿Cuál es el chance o probabilidad que usted creé tener de vivir hasta la edad de 70 años, en porcentaje? Escriba su respuesta usando la pantalla y luego presione la tecla 'Siguiente' para continuar. Su respuesta puede ser cualquier número entre 0 y 100 por ciento.

6.1 Ahora vamos hablar del concepto de CHANCE (es decir de PROBABILIDAD). Si nosotros echamos un volado (lanzamos una moneda al aire), el CHANCE o la PROBABILIDAD de que salga sol es 50%, ó UNO de cada DOS, porque una moneda tiene 2 lados.

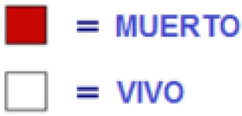
Si usted lanza un dado, la PROBABILIDAD de que salga cualquier número es UNO de cada SEIS, porque un dado tiene seis lados.



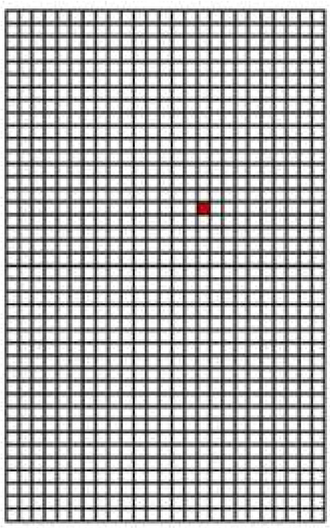
6.2 Podemos mostrar el concepto de probabilidad aún cuando hay varias o muchas posibilidades. Por ejemplo, si usted hace girar la rueda de una ruleta, con 36 números, la probabilidad de que salga un número es uno de cada 36. Podemos mostrarle lo que queremos decir con la imagen de abajo. La imagen muestra que hay una probabilidad de uno entre 36 de que salga el número 16 cuando la rueda de la ruleta se hace girar.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

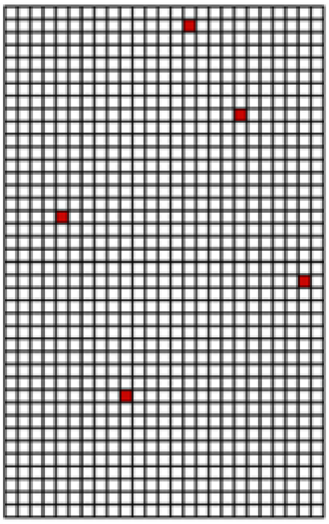
6.3 Ahora, vamos hacerle algunas preguntas sobre la probabilidad de morir de una persona. Le mostraremos imágenes para explicar esta probabilidad. En estas imágenes, los cuadros ROJOS muestran a las personas que morirán, y los cuadros BLANCOS muestran a las personas que vivirán:



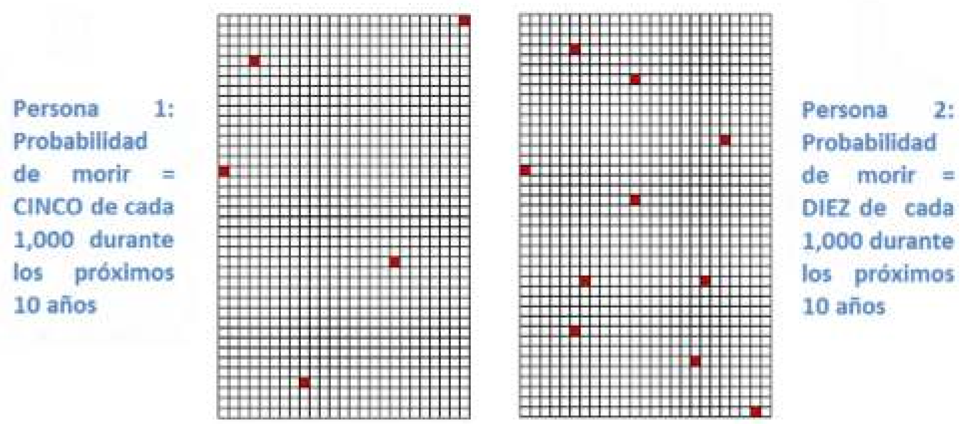
6.4 Supongamos que UNA persona de cada 1,000 personas morirá durante los próximos diez años. Podemos mostrar esto en la siguiente imagen. El rectángulo abajo contiene 1,000 cuadritos.



6.5 La imagen muestra que CINCO personas de cada 1,000 morirán durante los próximos diez años.



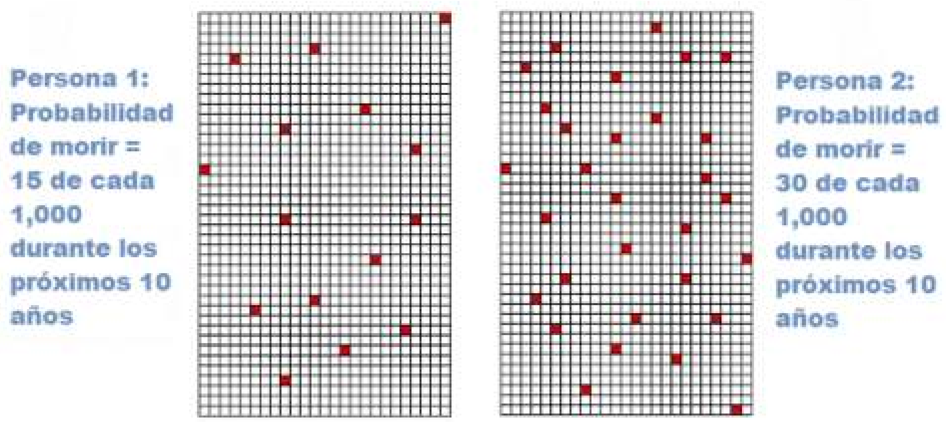
7.1 Supongamos que hay dos personas. Persona 1: Probabilidad de morir = CINCO de cada 1,000 durante los próximos 10 años Persona 2: Probabilidad de morir = DIEZ de cada 1,000 durante los próximos 10 años ¿Cuál de las dos personas tiene una mayor probabilidad de morir durante los próximos diez años?



- ❍ Persona 1
- ❍ Persona 2

7.2 Usted respondió que la Persona 1 tiene la mayor probabilidad de morir durante los próximos diez años, lo cual no es la respuesta que esperábamos. Tal vez no hemos explicado adecuadamente la pregunta. Debido a que la probabilidad de DIEZ en cada 1,000 es MAYOR que la probabilidad de CINCO en cada 1,000, la Persona 2 de la pantalla anterior es la persona que tiene la mayor probabilidad de morir durante los próximos diez años.

7.3 Supongamos que hay dos personas. Persona 1: Probabilidad de morir = 15 de cada 1,000 durante los próximos 10 años Persona 2: Probabilidad de morir = 30 de cada 1,000 durante los próximos 10 años ¿Cuál de las dos personas tiene una mayor probabilidad de morir durante los próximos diez años?



- ❍ Persona 1
- ❍ Persona 2

7.4 Usted respondió que la Persona 2 tiene la mayor probabilidad de morir durante los próximos diez años, y esta es la respuesta correcta. Debido a que la probabilidad de DIEZ personas de cada 1,000 personas posibles es MAYOR que la probabilidad de CINCO de cada 1,000 personas, la Persona 2 de la pantalla anterior es la persona que tiene la mayor probabilidad de morir durante los próximos diez años.

7.5 Piense en las mismas dos personas Persona 1: Probabilidad de morir = CINCO de cada 1,000 durante los próximos diez años Persona 2: Probabilidad de morir = DIEZ de cada 1,000 durante los próximos diez años ¿Qué persona preferiría ser?

- ❍ Persona 1
- ❍ Persona 2
- ❍ Sin Preferencia

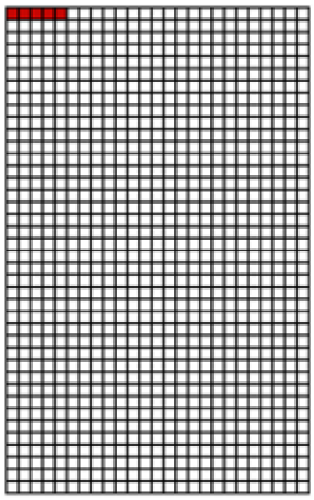
7.6 Piense en las mismas dos personas Persona 1: Probabilidad de morir = 15 de cada 1,000 durante los próximos diez años Persona 2: Probabilidad de morir = 30 de cada 1,000 durante los próximos diez años ¿Qué persona preferiría ser?

- ❍ Persona 1
- ❍ Persona 2
- ❍ Sin Preferencia

7.7 Usted ha declarado que prefiere ser la persona que tiene la mayor probabilidad de morir. Las personas pueden tener estas preferencias, pero nos gustaría confirmar su respuesta. ¿Su respuesta significa que dada la posibilidad de elegir entre la Persona 1 y Persona 2, usted preferiría ser la persona 2, la persona con la más alta probabilidad de morir, la Persona 2?

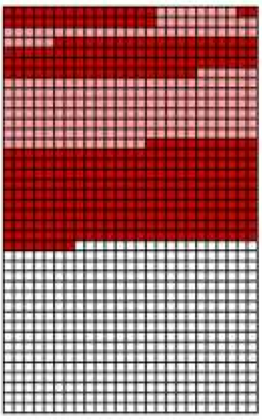
- ❍ Sí
- ❍ No

8.1 Los cuadritos rojos en las imágenes que usted ha visto han sido distribuidos para dar la idea de algo al azar. Se puede mostrar la misma información de la probabilidad de morir de una persona con cuadritos rojos agrupados. La imagen abajo muestra de una manera diferente que CINCO de cada 1,000 personas morirán durante los próximos diez años. Los cuadros rojos se muestran juntos para hacer más fácil ver la probabilidad de morir.



8.2 Ahora vamos a presentar a usted información sobre las diferentes formas de reducir su probabilidad de morir, sus costos y sus efectos. Esta información es sólo para proporcionarle información básica. No se hará un examen sobre la información, ni se espera que la memorice.

8.3 De acuerdo con la Secretaría de Salud la probabilidad de morir cada 10 años aumenta con la edad para los hombres. Estos incrementos se muestran en la siguiente imagen y tabla. Por ejemplo, a los 20 años de edad la probabilidad de morir en los próximos 10 años es igual a 15 en 1,000. Y así sucesivamente.

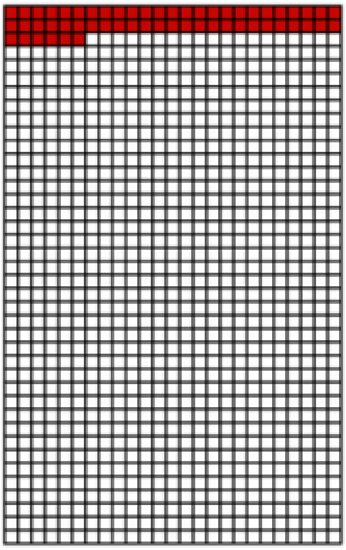


Edad	Probabilidad de morir en 10 años	Probabilidad de morir en 10 años en porcentajes
20	15 en 1,000	1.5%
30	23 en 1,000	2%
40	40 en 1,000	4%
50	80 en 1,000	8%
60	169 en 1,000	17%
70	339 en 1,000	34%
80	582 en 1,000	58%

8.4 Según la Secretaría de Salud una persona de su grupo de edad (entre 40 – 45 años) y sexo tiene una probabilidad de morir, durante los próximos diez años, de [56] en 1,000. Para el propósito de esta encuesta, por favor asuma que esta probabilidad de morir es la SUYA.

8.5 Una forma de comprender su probabilidad de morir es pensar en 1,000 personas de su grupo de edad y sexo. A partir de hoy hasta diez años [56] personas estarán muertas y [944] (el resto de las personas) seguirán vivas. Dado que usted no sabe ahora si va a estar vivo o muerto dentro de diez años, su probabilidad de morir durante los próximos diez años es [54] en 1,000.

8.6 La figura de abajo muestra la probabilidad de morir durante los próximos diez años para una persona de su grupo de edad y sexo.



9.1 Según la Secretaría de Salud, las cinco principales causas de muerte de las personas de su grupo de edad y sexo son:

Hombre, 40 a 45 años de edad
Enfermedades del hígado
Diabetes
Enfermedades del corazón
Accidentes vehiculares y otros
Agresiones (homicidios)

9.2 Las personas toman acciones en su vida diaria para reducir su probabilidad de morir. Algunas de estas acciones, como las pruebas de detección anuales o las visitas al médico, son acciones médicas. Otras acciones, como hacer ejercicio, no fumar, o consumir una dieta saludable, son acciones no médicas.

Acción médica	Reduce la Probabilidad de Morir de…
Prueba de sangre	Diabetes
Realizar el cuestionario de evaluación de riesgos	Diabetes
Chequeo y tratamiento con fármacos para controlar la hipertensión y el colesterol	Enfermedades del corazón
Examen de detección	Cáncer de próstata

9.3 Estos son algunos ejemplos de acciones médicas comunes que los hombres toman para reducir su probabilidad de morir a causa de ciertas enfermedades:

Acciones no médicas	Reduce la probabilidad de morir de…
Mantener un peso corporal saludable	Diabetes
Caminata diaria de 30 minutos	Enfermedad del corazón
Evite fumar e inhalar el humo del tabaco de otras personas	Cáncer de los bronquios y del pulmón

9.4 Estos son algunos ejemplos de acciones no médicas comunes que los hombres toman para reducir su probabilidad de morir a causa de ciertas enfermedades:

Persona	Acción tomada cada año por los próximos diez años	Reducción de su probabilidad de morir durante 10 años
Hombre de 45 años de edad	Prueba de sangre cada 3 años para detectar diabetes	3 de 1,000
Hombre de 45 años de edad con niveles de glucosa fuera de los parámetros normales	Prueba de sangre cada 1 ó 2 años para detectar diabetes	2 en 1,000
Hombre de 50 años de edad con hipertensión	Chequeo y tratamiento regular con fármacos para controlar la hipertensión	1 de 1,000

9.5 La siguiente tabla muestra cuánto REDUCEN algunas de las acciones médicas la probabilidad de morir de una persona durante los próximos diez años.

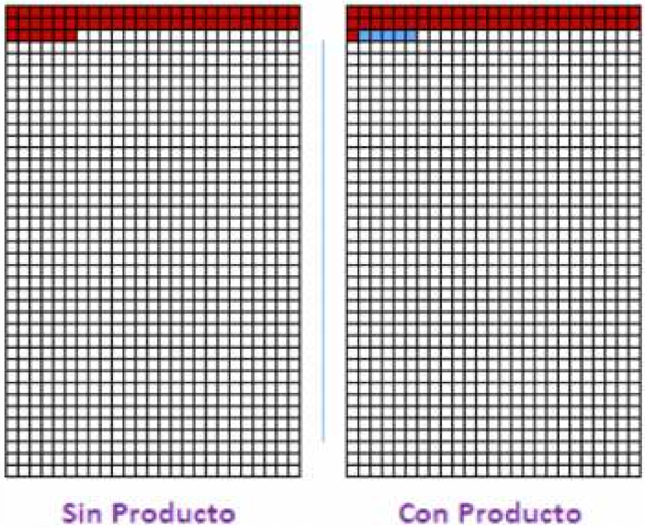
Tratamiento	Clasificación del costo
Realizar el cuestionario de evaluación de riesgos para la diabetes	Barato
Prueba de sangre para detectar diabetes	Barato
Chequeo y tratamiento con fármacos para controlar la hipertensión y el colesterol	Caro
Examen de detección del cáncer de próstata	Barato

9.6 Los costos de las acciones que las personas toman para reducir su riesgo o probabilidad de morir varían por acción. Sus costos también dependen de la cobertura de seguro que usted tenga. Aún cuando la acción es GRATIS para usted. La siguiente tabla clasifica algunas de las acciones que acabamos de mencionar por sus costos anuales para el tratamiento de una persona, sin importar quién paga.

10.1 A continuación estaremos preguntando sobre cosas que le costarán dinero. Por favor, tenga en cuenta el presupuesto de su familia a medida que contesta cada pregunta.

11.1 Suponga que un nuevo producto está disponible y que, al consumirlo durante los próximos diez años, reduciría su probabilidad de morir a causa de una enfermedad. Este nuevo producto reduciría su probabilidad de morir durante los próximos diez años de: [56] en 1,000 a [51] en 1,000

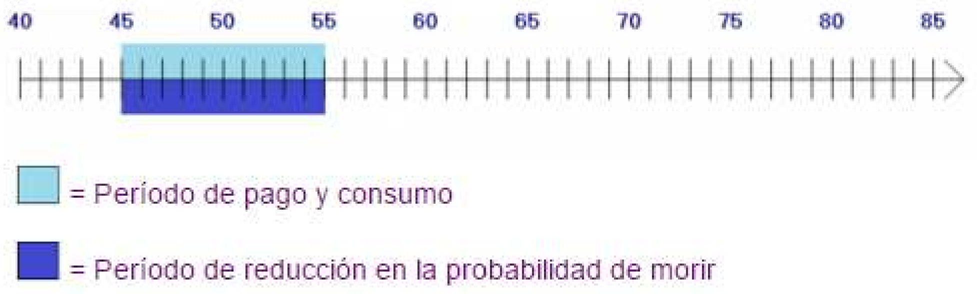
11.2 La imagen del lado izquierdo muestra cuál sería su probabilidad de morir si no consume el producto. La imagen de la derecha muestra cual sería su probabilidad de morir si consume el producto. Los cuadros azules muestran en cuánto el producto reduce la probabilidad de morir.



11.3 Si usted fuera a consumir este producto, tendría que pagar el monto total de los gastos de su propio bolsillo. El producto se paga cada año durante los próximos diez años, y se empieza a pagar este año.   Para que el producto tenga un efecto usted necesitaría consumirlo cada año durante diez años empezando este año.

11.4 Entendemos que la mayoría de las personas no acepta simplemente la idea de que está garantizado que el producto funcione sin prueba alguna. Para responder a las siguientes preguntas del cuestionario, por favor asuma que el producto ha demostrado ser seguro y eficaz en las pruebas requeridas por reconocidas instituciones internacionales de salud.

11.5 La línea que se presenta abajo muestra: una barra de color azul claro que representa el periodo durante el cual usted tendría que pagar el producto y consumir el producto; y una barra de color azul obscuro, que muestra el periodo durante el cual usted recibiría la reducción en su probabilidad de morir. De [56] en 1,000 a [51] en 1,000.



Por favor, tenga en cuenta que usted tendría que pagar el costo de este mismo producto. ¿Cuál es el precio máximo que está dispuesto a pagar cada año en los próximos 10 años por este producto?

- 0
- 25
- 50
- 100
- 200
- 300
- 400
- 500
- 600
- 800
- 1,000
- 1,300
- 1,600
- 2,000
- 2,500
- 3,000
- 3,500
- 4,000
- 5,000
- 7,000

- 9,000
- 12,000
- 15,000
- más de 15,000

11.5.a Timing

First Click

Last Click

11.11 ¿Qué tan seguro se siente usted acerca de su respuesta a la pregunta de disposición a pagar por este producto? Seleccione su respuesta entre 1 y 7, donde 1 es Muy incierto y 7 es Muy seguro. ← ← Muy incierto Muy seguro → →

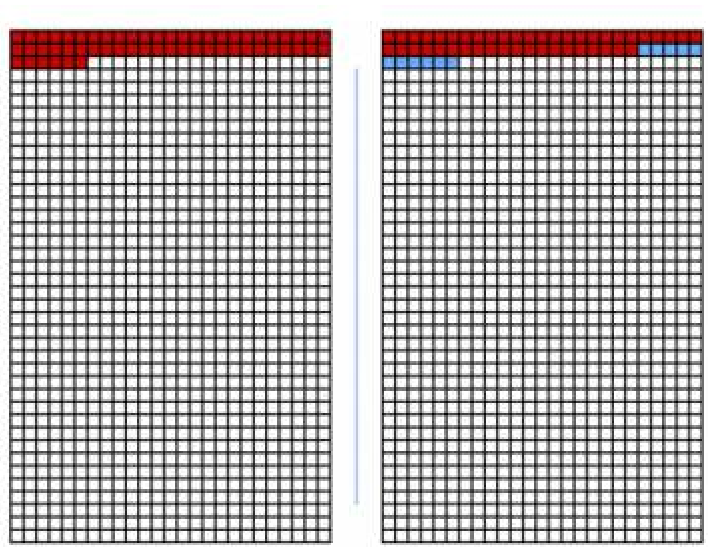
- 1
- 2
- 3
- 4
- 5
- 6
- 7

11.12 Usted indicó que no estaba dispuesto a pagar por el producto para reducir la probabilidad de morir en los próximos 10 años de 5 en 1,000. Diría usted que la razón principal por la que no estaba dispuesto a pagar por este producto era:

- Siempre he desconfiado de los nuevos productos o medicamentos
- No podía pagar por el producto
- No me gustaría consumir un producto para reducir mi probabilidad de morir
- Quería más información sobre los productos
- La reducción en mi probabilidad de morir era demasiado baja
- Otro

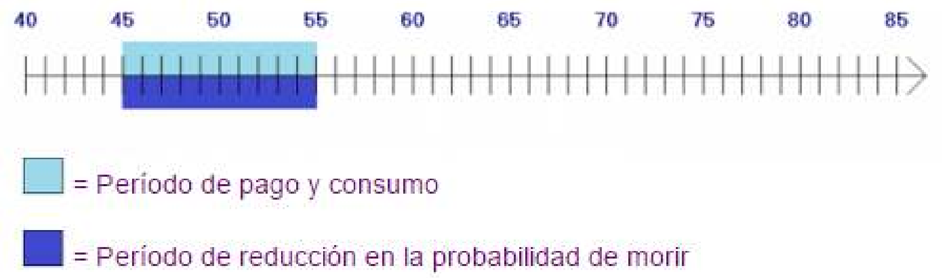
12.1 Ahora suponga que un producto nuevo y DIFERENTE está disponible y que al consumirlo durante los próximos diez años, reduciría su probabilidad de morir a causa de una enfermedad. Este nuevo producto reduciría su probabilidad de morir durante los próximos diez años como se muestra abajo. [56] en 1,000 a [46] en 1,000

12.2 La imagen del lado izquierdo muestra cuál sería su probabilidad de morir si no consume el producto. La imagen de la derecha muestra cual sería su probabilidad de morir si consume el producto. Los cuadros azules muestran en cuánto el producto reduce la probabilidad de morir.



12.3 Si usted fuera a consumir este producto, tendría que pagar el monto total de los gastos de su propio bolsillo. El producto se paga cada año durante los próximos diez años y se empieza a pagar este año. Para que el producto tenga un efecto, usted necesitaría consumirlo cada año durante diez años empezando este año. Al igual que antes, por favor asuma que el producto ha demostrado ser seguro y eficaz en las pruebas requeridas por instituciones internacionales de salud.

12.4 La línea que se presenta abajo muestra: una barra de color azul claro que representa el periodo durante el cual usted tendría que pagar el producto y consumir el producto; y una barra de color azul obscuro, que muestra el periodo durante el cual usted recibiría la reducción en su probabilidad de morir. De [56] en 1,000 a [46] en 1,000.



Por favor, tenga en cuenta que usted tendría que pagar el costo de este mismo producto. ¿Cuál es el precio máximo que está dispuesto a pagar cada año en los próximos 10 años por este producto?

- 0
- 25
- 50
- 100
- 200
- 300
- 400
- 500
- 600
- 800
- 1,000
- 1,300
- 1,600
- 2,000
- 2,500
- 3,000
- 3,500

- 4,000
- 5,000
- 7,000
- 9,000
- 12,000
- 15,000
- más de 15,000

12.4.a Timing

First Click
Last Click

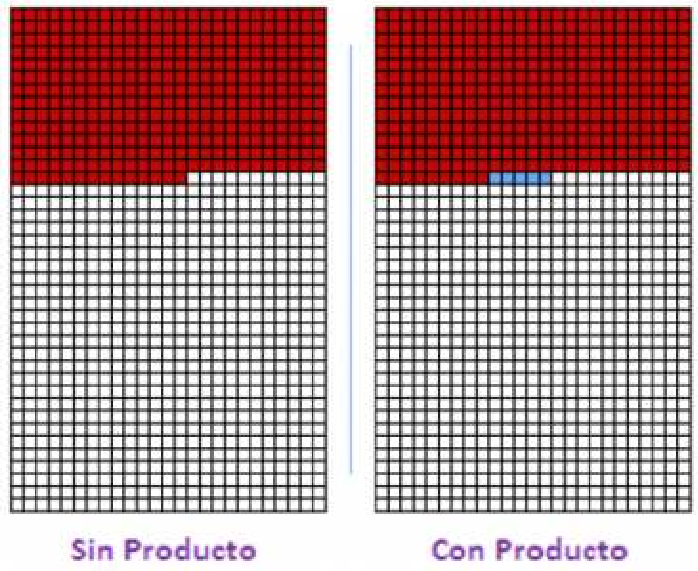
12.10 ¿Qué tan seguro se siente usted acerca de su respuesta a la pregunta de disposición a pagar por este producto? Seleccione su respuesta entre 1 y 7, donde 1 es Muy incierto y 7 es Muy seguro. ← ← Muy incierto Muy seguro → →

- 1
- 2
- 3
- 4
- 5
- 6
- 7

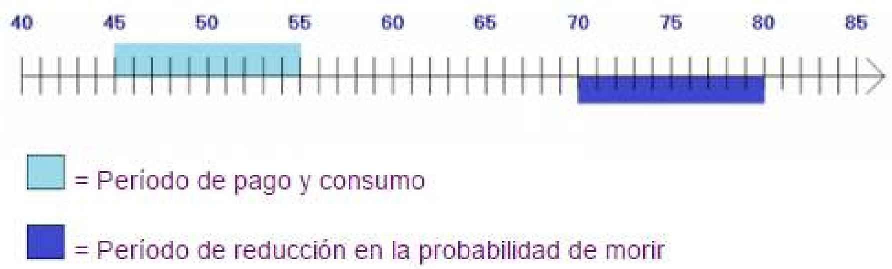
15.1 Ahora, estaremos preguntando acerca de un producto de DIFERENTE clase. Suponga que está disponible y que al consumirlo durante los próximos diez años reducirá su probabilidad de morir ENTRE LA EDAD DE 70 Y 80 AÑOS a causa de una enfermedad.

15.2 De acuerdo a la Secretaría de Salud para alguien de su sexo, y en caso de que usted viva hasta los 70 años, su probabilidad de morir entre la edad de 70 y 80 años es de [339] en 1,000. Este producto podría reducir su probabilidad de morir entre la edad de 70 y 80 años de: [339] en 1,000 a [334] en 1,000

15.3 La imagen de la izquierda muestra cuál sería su probabilidad de morir entre la edad de 70 y 80 años si no consume el producto. La imagen de la derecha muestra cuál sería su probabilidad de morir si consume el producto a partir de ahora y durante los próximos 10 años. Los cuadros azules muestran cuánto reduce el producto su probabilidad de morir más tarde, entre la edad de 70 y 80 años.



15.4 La línea que se presenta abajo muestra: una barra de color azul claro que representa el periodo durante el cual usted tendría que pagar el producto y consumir el producto; y una barra de color azul obscuro, que muestra el periodo durante el cual usted recibiría la reducción en su probabilidad de morir. De [339] en 1,000 a [334] en 1,000.



Por favor, tenga en cuenta que usted tendría que pagar el costo de este mismo producto. ¿Cuál es el precio máximo que está dispuesto a pagar cada año en los próximos 10 años por este producto?

- ❍ 0
- ❍ 25
- ❍ 50
- ❍ 100
- ❍ 200
- ❍ 300
- ❍ 400
- ❍ 500
- ❍ 600
- ❍ 800
- ❍ 1,000
- ❍ 1,300
- ❍ 1,600
- ❍ 2,000
- ❍ 2,500
- ❍ 3,000
- ❍ 3,500
- ❍ 4,000
- ❍ 5,000
- ❍ 7,000
- ❍ 9,000
- ❍ 12,000
- ❍ 15,000
- ❍ más de 15,000

15.4.a Timing

First Click

Last Click

15.10 ¿Qué tan seguro se siente usted acerca de su respuesta a la pregunta de disposición a pagar por este producto? Seleccione su respuesta entre 1 y 7, donde 1 es Muy incierto y 7 es Muy seguro. ← ← Muy incierto Muy seguro → →

- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7

16.1 En esta encuesta se utilizó el concepto de "probabilidad". ¿Qué tan bien diría usted que entendió el concepto de probabilidad? Seleccione su respuesta entre 1 y 7, donde 1 es no entendió y 7 es entendió muy bien. ← ← No entendió Entendió muy bien → →

- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7

16.2 Anteriormente hemos dicho que la probabilidad de morir para alguien de su grupo de edad y sexo en los próximos diez años es: [56] en 1,000 Le pedimos que aceptara esta probabilidad de morir como la suya. ¿Creé que esta probabilidad se aplica a usted?

- ❍ Sí

- No

16.3 Cree usted que su probabilidad de morir durante los próximos diez años es más alta o más baja que [56] en 1,000

- Más alta
- Más Baja

16.4 Cuando usted dio su respuesta a cuánto estaría dispuesto a pagar por un producto que disminuye su probabilidad de morir… …¿Estaba usted pensando en un producto en específico?

- Sí
- No
- No lo sabe

16.5 ¿En qué tipo de producto estaba usted pensando?

- Una inyección
- Una píldora
- Una prueba anual de detección
- Un cambio de dieta
- Un producto no médico

16.6 Cuando dio su respuesta a cuánto estaría usted dispuesto a pagar por un producto que disminuiría su probabilidad de morir......¿Tuvo usted alguna duda que el producto funcionaría como lo describimos?

- Sí
- No
- No lo sabe

16.7 ¿Algunas de las dudas que usted tuvo sobre el funcionamiento del producto influyeron en su disposición a pagar por este?

- Sí
- No
- No lo sabe

16.8 ¿Las dudas que usted tuvo sobre el funcionamiento del producto incrementaron o disminuyeron su disposición a pagar por el producto?

- Incrementaron
- Disminuyeron
- No lo sabe

16.9 Cuando dio su respuesta a cuánto estaría usted dispuesto a pagar por un producto que disminuiría la probabilidad de morir… …¿Creyó usted que sufriría efectos secundarios como consecuencia de usar el producto?

- Sí
- No
- No lo sabe

16.10 …¿Usted tuvo en cuenta si podría realmente permitirse hacer los pagos para comprar los productos?

- Sí
- No
- No lo sabe

16.11 Cuando dio usted su respuesta a cuánto estaría dispuesto a pagar por un producto que disminuye la probabilidad de morir usted…

- Pensó solo en el cambio en su probabilidad de morir al tomar el producto
- Además, consideró también otras mejoras en su salud al tomar el producto
- No lo sabe

16.12 ¿Sus consideraciones sobre estos OTROS beneficios influyeron en la cantidad que usted estaba dispuesto a pagar por los productos?

- ❍ Sí
- ❍ No
- ❍ No lo sabe

16.13 ¿Sus consideraciones sobre otros beneficios del producto incrementaron o disminuyeron su disposición a pagar por los productos?

- ❍ Incrementaron
- ❍ Disminuyeron
- ❍ No lo sabe

16.14 De los otros beneficios del producto que usted consideró, ¿cuál es el más importante?

- ❍ Otros beneficios en su salud
- ❍ Beneficios para prolongar la vida de otras personas
- ❍ Mejora de la salud de otras personas
- ❍ Otros

16.15 Cuándo nosotros le preguntamos acerca de su disposición a pagar por un producto que reduciría su probabilidad de morir durante los próximos diez años... ...¿Entendió usted que tendría que hacer el pago una vez al año durante los próximos diez años?

- ❍ Sí
- ❍ No
- ❍ No lo sabe

17.1 Cuando dio usted su respuesta a la cantidad que estaría dispuesto a pagar por un producto que disminuiría su probabilidad de morir entre la edad de 70 y 80 años… …¿Consideró usted si viviría a la edad 70 años?

- ❍ Sí
- ❍ No
- ❍ No lo sabe

17.2 ...¿Pensó usted en cómo sería su salud a la edad de 70 años?

- ❍ Sí
- ❍ No
- ❍ No lo sabe

17.3 …¿Entendió usted que necesitaría empezar a hacer los pagos este año?

- ❍ Sí
- ❍ No
- ❍ No lo sabe

18.1 ¿Qué tipo de cobertura de seguro tiene?(marque todas las que apliquen)

- ❑ No tiene cobertura de seguro
- ❑ Seguro a través del plan de salud del empleador
- ❑ Seguro a través del plan de salud privado
- ❑ Seguro Popular
- ❑ Otros
- ❑ No lo sabe

18.2 ¿Cuál de los siguientes lo describe mejor?

- Casado
- Divorciado
- Separado
- Viudo
- Soltero
- Otro

18.3 ¿Cuántas personas de su familia viven en su hogar, incluyéndose usted? Cuente a todas las personas que dependen económicamente del ingreso total de su hogar. Escriba su respuesta usando la pantalla y luego presione ‘Siguiente’ para continuar.

18.4 ¿Cuántos hijos o hijas tiene usted que estén vivos actualmente? Escriba su respuesta usando la pantalla y luego presione 'Siguiente' para continuar. Si esto no le aplica por favor escriba el número 0.

18.5 ¿Cuántos hijos o hijas tiene usted menores de 18 años de edad?

18.6 ¿Cuál es el nivel escolar más alto que ha completado?

- Sin educación formal
- Primaria incompleta
- Primaria
- Secundaria incompleta
- Secundaria
- Preparatoria incompleta
- Preparatoria
- Universidad técnica incompleta
- Universidad técnica
- Licenciatura no concluida
- Licenciatura
- Maestría o doctorado

18.7 ¿Es usted miembro de una organización social o religiosa?

	Es miembro y participa	Es miembro pero no participa	Fue miembro/participó en el pasado	Nunca ha pertenecido
Club / equipo deportivo	❍	❍	❍	❍
Partido político / organización política	❍	❍	❍	❍
Asociación de asistencia social o ONG	❍	❍	❍	❍
Club social o cultural	❍	❍	❍	❍
Iglesia, Parroquia o grupo religioso	❍	❍	❍	❍
Junta vecinal o asociación de colonos	❍	❍	❍	❍
Organización educativa (asociación de padres / exalumnos, etc)	❍	❍	❍	❍

18.8 ¿Realizó usted trabajo voluntario con alguna organización en el último año?

❍ Sí

❍ No

18.8a ¿Cree usted que si necesitara...

	Imposible conseguirla	Difícil de conseguirla	Ni fácil ni difícil conseguirla	Fácil de conseguirla	Muy fácil de conseguirla
... pedirle a alguien la cantidad de dinero que se gana en un mes, le sería… ?	❍	❍	❍	❍	❍
... pedir ayuda para que lo cuiden a usted en una enfermedad, le sería... ?	❍	❍	❍	❍	❍
... pedir ayuda para conseguir un trabajo, le sería… ?	❍	❍	❍	❍	❍
... pedir ayuda para que lo acompañen al doctor, le sería... ?	❍	❍	❍	❍	❍

... pedir cooperación para realizar mejoras en su colonia o localidad, le sería... ?	❍	❍	❍	❍	❍

18.8b ¿Con qué frecuencia realiza las siguientes actividades?

	Nunca lo hace	Unas cuantas veces al año	Una ó dos veces por mes	Todas ó casi todas las semanas
Pasar tiempo con sus amigos	❍	❍	❍	❍
Pasar tiempo en actividades sociales con sus colegas o compañeros de trabajo o profesión	❍	❍	❍	❍
Pasar tiempo en actividades sociales con sus vecinos	❍	❍	❍	❍

18.9 ¿Como se describiría a si mismo?

❍ Muy religioso
❍ Algo religioso
❍ Ni religioso ni no religioso
❍ Algo no religioso
❍ No religioso

18.10 BIENESTAR PERSONAL ¿Cuán satisfecho está usted en estos días con su vida? 1 significa que usted no está nada feliz y 10 significa que usted está completamente feliz. ¿Dónde se ubica usted? Nada Completamente

- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ 10

18.11 ¿Hasta dónde siente usted que las cosas que hace en su vida valen la pena? Nada Completamente

- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ 10

18.12 BIENESTAR PERSONAL (2) ¿Cuán feliz se sintió usted ayer? Nada Completamente

- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ 10

18.13 ¿Cuán ansioso se sintió usted ayer? Nada Completamente

- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5
- ❍ 6
- ❍ 7
- ❍ 8
- ❍ 9
- ❍ 10

18.13.a En términos generales, ¿diría usted que se puede confiar en la mayoría de las personas o que no se puede ser tan confiado al tratar con la gente?

- ❍ Se puede confiar en la mayoría de las personas
- ❍ No se puede ser tan confiado

18.14 ¿Cuánta confianza tiene usted en las siguientes organizaciones?

	Mucha	Algo	Poca	Nada
Las iglesias	❍	❍	❍	❍
Organizaciones humanitarias o caritativas	❍	❍	❍	❍
Organizaciones de protección al medio ambiente	❍	❍	❍	❍
Las Universidades de México	❍	❍	❍	❍
Las Universidades de Estados Unidos	❍	❍	❍	❍
Secretaría de Medio Ambiente	❍	❍	❍	❍
Secretaría de Salud	❍	❍	❍	❍
La prensa	❍	❍	❍	❍
El gobierno de la República	❍	❍	❍	❍
Los partidos políticos	❍	❍	❍	❍

Las grandes empresas	❍	❍	❍	❍
La policía	❍	❍	❍	❍
Los tribunales y juzgados	❍	❍	❍	❍

18.15 ¿Con qué frecuencia fuma usted un cigarro?

- ❍ Todos los días
- ❍ La mayor parte de los días
- ❍ Algunos días
- ❍ Nunca

18.16 ¿Cuál es su situación laboral actual?

- ❍ Trabajo a tiempo completo
- ❍ Trabajo a tiempo parcial
- ❍ Labores del hogar
- ❍ Estudiante
- ❍ Desempleado
- ❍ Retirado

18.17 - Ingreso FAMILIAR ¿Cuál de estos rangos refleja el valor total aproximado ANUAL de los ingresos de todos los miembros de su hogar, quitándole impuestos? Por favor incluya todas sus fuentes de ingreso, como salarios, pensiones y beneficios, e inversiones, entre otros.

- ❍ $7,000 ó menos
- ❍ $7.001-$15.000

- $15.001-$30.000
- $30.001-$45.000
- $45.001-$60.000
- $60.001-$75.000
- $75.001-$90.000
- $90.001-$110.000
- $110.001-$140.000
- $140.001-$180.000
- $180.001-$240.000
- $240.001-$320.000
- $320.001-$385.000
- $385.001-$451.000
- $451.001-$520.000
- $520.001-$598.000
- $598.001-$687.000
- $687.001-$803.000
- $803.001-$1.002.000
- Más de $1.002.000

18.18 - Ingreso PERSONAL ¿Cuál de estos rangos refleja el valor total aproximado ANUAL de sus ingresos personales, quitándole impuestos?

- $7,000 ó menos
- $7.001-$15.000
- $15.001-$30.000
- $30.001-$45.000
- $45.001-$60.000
- $60.001-$75.000
- $75.001-$90.000
- $90.001-$110.000
- $110.001-$140.000
- $140.001-$180.000
- $180.001-$240.000
- $240.001-$320.000
- $320.001-$385.000

- $385.001-$451.000
- $451.001-$520.000
- $520.001-$598.000
- $598.001-$687.000
- $687.001-$803.000
- $803.001-$1.002.000
- Más de $1.002.000

18.19 En parte, su salud depende del sitio donde Usted vive y trabaja. ¿Cuáles son los códigos postales donde Usted pasa mas tiempo? Si no le aplica, por favor deje en blanco la caja de texto. En caso de duda, puede consultar el servicio de consulta de códigos postales de Correos de México en: http://www.correosdemexico.gob.mx/ServiciosLinea/Paginas/ccpostales.aspx ¿Cuál es el código postal de su trabajo o escuela?

Código postal

18.19 ¿Cuál es el código postal del sitio donde vive?

Código postal

19 Ha llegado al final de la encuesta. Muchas gracias por haberla completado. -------------- CONFIDENCIALIDAD DE LA ENCUESTA Conforme a las disposiciones del Articulo 16, del Reglamento de la Ley General de Salud en materia de Investigación para la Salud, en vigor: "En las investigaciones en seres humanos se protegerá la privacidad del individuo sujeto de investigación, identificándolo solo cuando los resultados lo requieran y éste lo autorice." En referencia directa al Articulo 38, de la Ley de Información Estadística y Geográfica en vigor, "Los datos e informes que los particulares proporcionen para fines estadísticos o provengan de registros administrativos o civiles, serán manejados, para efectos de esta Ley, bajo la observancia de los principios de confidencialidad y reserva y no podrán comunicarse, en ningún caso, en forma nominativa o individualizada, ni harán prueba ante autoridad administrativa o fiscal, ni en juicio o fuera de el." -------------- Presione 'Siguiente' para salvar su encuesta.

Annex 2.2 - Screenshots from the questionnaire

Figure 9 - Explanation of the concept of probability

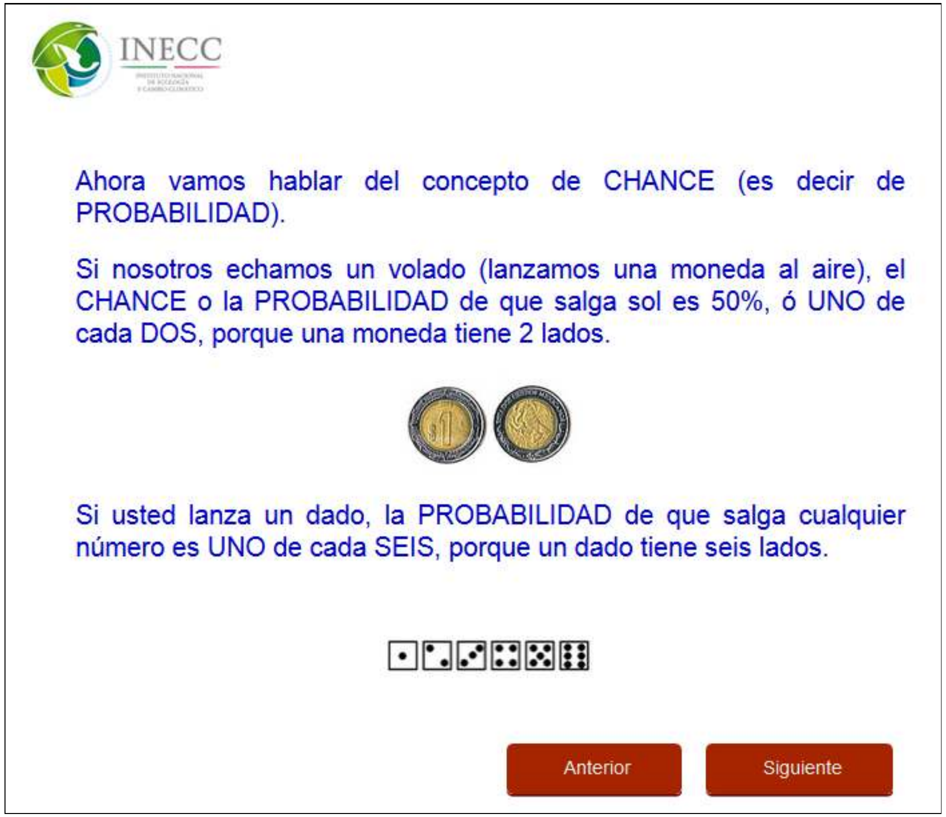


Figure 10 - Understanding of probability test

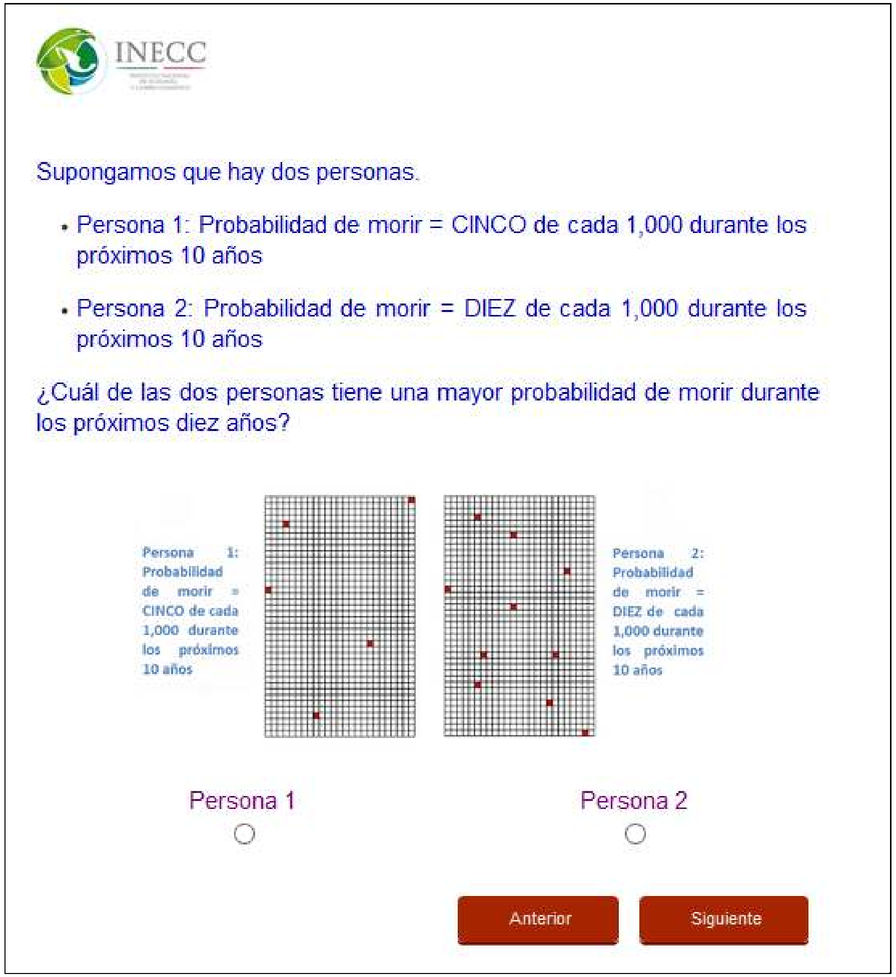


Figure 11 - Leading causes of death, by age and gender (woman 51-55 y.o. example)

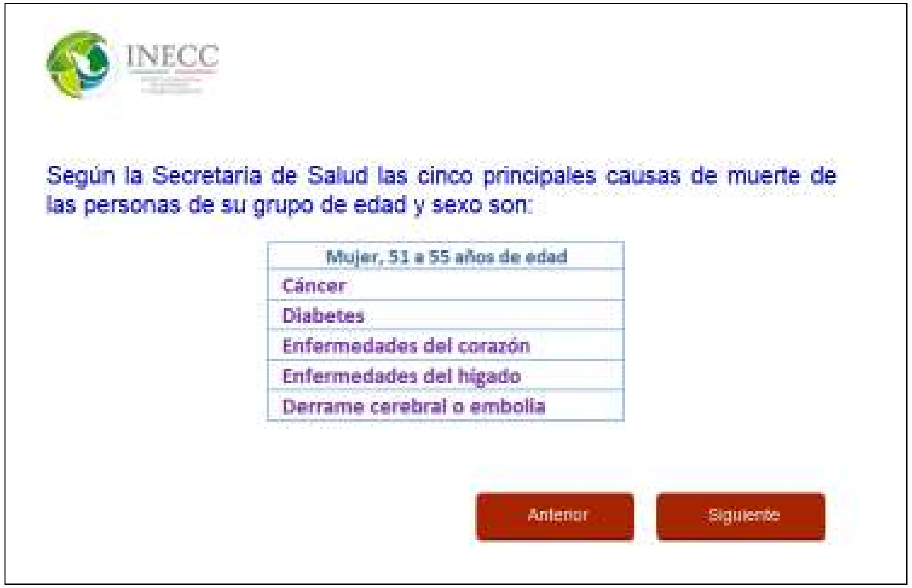


Figure 22 - Reminder that medical procedures to reduce mortality risks have associated costs

INECC

Los costos de las acciones que las personas toman para reducir su riesgo o probabilidad de morir varían por acción.

Sus costos también dependen de la cobertura de seguro que usted tenga. Aún cuando la acción es GRATIS para usted.

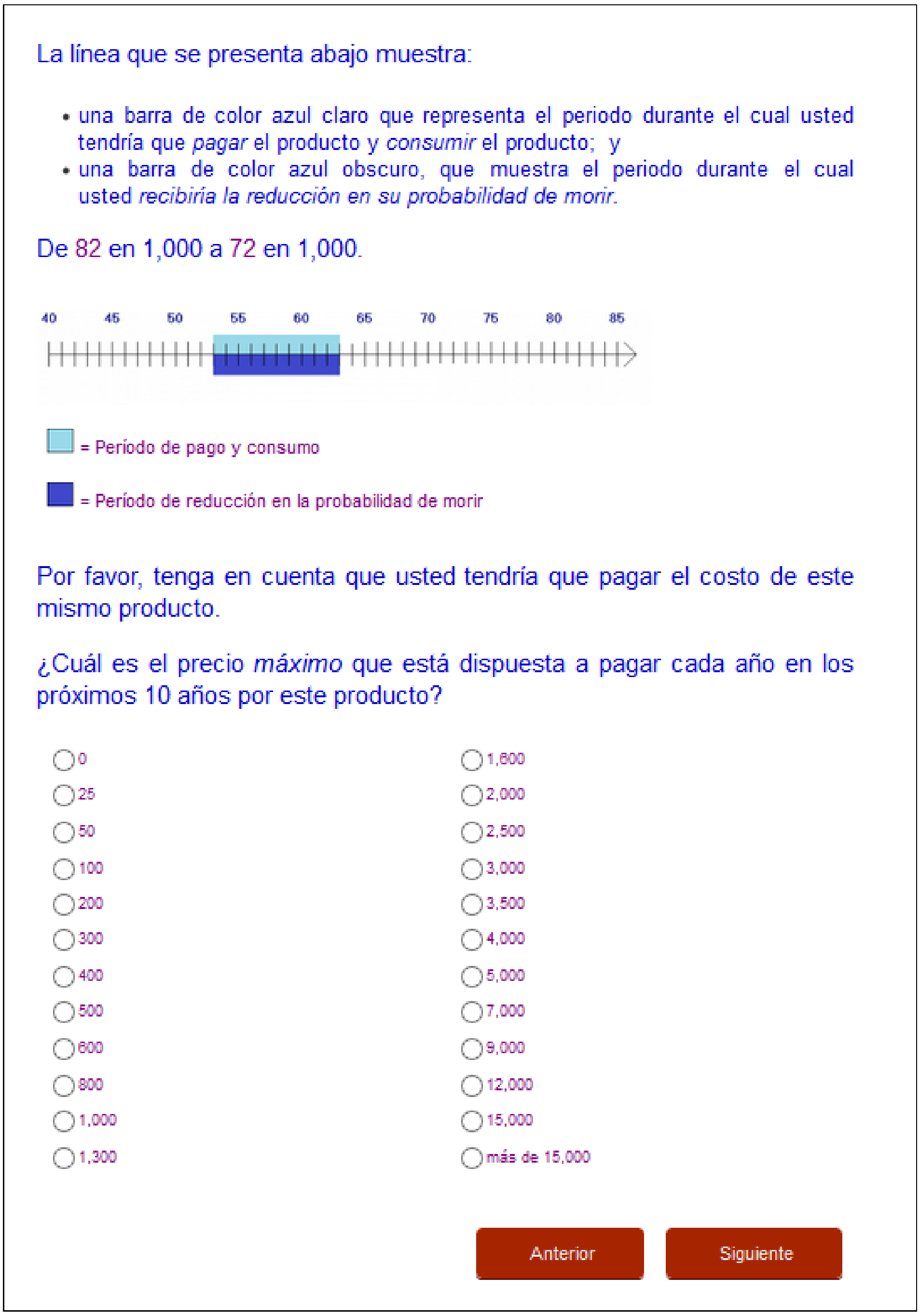
La siguiente tabla clasifica algunas de las acciones que acabamos de mencionar por sus costos anuales para el tratamiento de una persona, sin importar quién paga.

Tratamiento	Clasificación del costo
Prueba de sangre para detectar diabetes	Barato
Realizar el cuestionario de evaluación de riesgos para la diabetes	Barato
Chequeo y tratamiento con fármacos para controlar la hipertensión y el colesterol	Caro
Mamografía	Caro

Anterior Siguiente

Figure 13 - Graphical representation of baseline mortality risk (in red) and a 10 in 10,000 mortality risk reduction (or 10 in 1,000 over 10 years; in blue)

Figure 34 - Payment screen asking for maximum willingness to pay



La línea que se presenta abajo muestra:

- una barra de color azul claro que representa el periodo durante el cual usted tendría que *pagar* el producto y *consumir* el producto; y
- una barra de color azul obscuro, que muestra el periodo durante el cual usted *recibiría la reducción en su probabilidad de morir*.

De 82 en 1,000 a 72 en 1,000.

= Período de pago y consumo

= Período de reducción en la probabilidad de morir

Por favor, tenga en cuenta que usted tendría que pagar el costo de este mismo producto.

¿Cuál es el precio *máximo* que está dispuesta a pagar cada año en los próximos 10 años por este producto?

◯ 0	◯ 1,600
◯ 25	◯ 2,000
◯ 50	◯ 2,500
◯ 100	◯ 3,000
◯ 200	◯ 3,500
◯ 300	◯ 4,000
◯ 400	◯ 5,000
◯ 500	◯ 7,000
◯ 600	◯ 9,000
◯ 800	◯ 12,000
◯ 1,000	◯ 15,000
◯ 1,300	◯ más de 15,000

Anterior Siguiente

Annex 2.3 - Statistical tables

Table 25 – Socioeconomic data and subsamples

		FULL SAMPLE n = 1192	SAMPLE A n = 761	SAMPLE B n = 727	SAMPLE C n = 626	SAMPLE D n = 176	FLAG8 n = 591	SAMPLE A* n = 460	SAMPLE B* n = 448	SAMPLE C* n = 396	SAMPLE D* n = 119
Age											
	40-50	46.0%	42.4%	43.7%	44.4%	43.2%	49.6%	48.0%	48.9%	49.0%	45.4%
	51-60	29.9%	31.5%	31.6%	30.7%	27.3%	30.6%	30.9%	30.8%	30.8%	29.4%
	61-70	17.9%	17.7%	19.8%	16.3%	18.2%	15.1%	15.4%	15.0%	14.1%	16.0%
	71-75	6.3%	8.3%	7.8%	8.6%	11.4%	4.7%	5.7%	5.4%	6.1%	9.2%
Income		123,439	107,940	108,633	104,055	105,249	75,668	77,804	79,140	74,946	78,457
Male		46.0%	45.2%	53.9%	54.5%	55.1%	54.0%	53.7%	53.6%	54.0%	57.1%
Married		74.0%	71.2%	72.1%	72.0%	63.1%	78.9%	80.0%	80.8%	80.6%	72.3%
University education		16.1%	10.4%	10.7%	9.3%	10.8%	5.8%	5.2%	5.4%	5.0%	4.6%
Health											
	has bad health	6.9%	7.1%	6.2%	6.1%	7.4%	4.1%	4.4%	4.0%	4.0%	4.2%
	family illness	55.0%	58.9%	58.2%	58.6%	63.1%	50.1%	56.5%	56.3%	57.6%	58.0%
	family cancer	26.9%	24.2%	23.4%	23.0%	26.1%	16.4%	16.3%	16.3%	16.2%	20.2%
	own illness	37.1%	41.8%	41.1%	40.9%	44.3%	31.6%	35.9%	35.9%	37.1%	37.8%
	own cancer	2.4%	2.5%	2.2%	1.9%	2.8%	3.1%	2.4%	2.2%	2.0%	4.2%
	visited emergencies in last 5 years	10.7%	13.3%	12.7%	13.1%	13.1%	12.0%	14.6%	14.5%	15.2%	13.5%
	visited hospital in last 5 years	9.5%	10.9%	10.3%	10.1%	10.2%	7.5%	9.4%	9.2%	9.3%	8.4%

Table 26 - Construct validity - contemporaneous WTP (Weibull, upper bound)

Contemporaneous WTP	Sample C				Sample A*				Sample C*			
	Specification 1		Specification 2		Specification 1		Specification 2		Specification 1		Specification 2	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Age	-0.03	0.05	-0.01	0.05	-0.11 *	0.06	-0.08	0.06	-0.15 **	0.06	-0.11 *	0.06
Age squared	0.00	0.00	0.00	0.00	0.00 **	0.00	0.00	0.00	0.00 **	0.00	0.00 *	0.00
Female (=1)	0.05	0.08	0.07	0.08	0.01	0.09	0.06	0.09	0.03	0.10	0.09	0.10
Household pc income (log)	0.30 ***	0.03	0.27 ***	0.03	0.23 ***	0.04	0.26 ***	0.04	0.24 ***	0.04	0.27 ***	0.04
Married (=1)	-0.21 **	0.09	-0.13	0.09	-0.33 ***	0.12	-0.27 **	0.11	-0.36 **	0.13	-0.29 **	0.13
University education (=1)	0.52 ***	0.14	0.40 ***	0.14	0.39 **	0.20	0.41 **	0.20	0.29	0.22	0.33	0.22
Very religious (=1)			-0.51 ***	0.19			-0.59 ***	0.21			-0.53 **	0.24
Smoker (=1)			0.13	0.09			-0.09	0.10			0.00	0.11
Own insurance (=1)			0.39 ***	0.13			-0.05	0.16			-0.19	0.17
Heart disease (=1)			-0.03	0.14			-0.19	0.15			-0.17	0.16
Bronchitis (=1)			0.26 *	0.13			0.32 *	0.19			0.38 **	0.19
Asthma (=1)			-0.19	0.16			-0.21	0.17			-0.12	0.19
High blood pressure (=1)			0.14	0.09			0.14	0.11			0.13	0.11
Cancer (=1)			0.05	0.27			0.16	0.30			0.29	0.34
5 in 1,000 risk	-0.08	0.08	-0.12	0.08	-0.12	0.09	-0.11	0.09	-0.21 **	0.10	-0.18 *	0.10
Constant	4.93 ***	1.30	5.50 ***	1.32	7.83 ***	1.64	7.89 ***	1.68	8.77 ***	1.77	8.42 ***	1.80
Scale parameter	1.14	0.04	1.17	0.04	1.17	0.04	1.21	0.05	1.19	0.05	1.23	0.05
Number of observations	536		536		384		384		324		324	

Note: AFT (Accelerated Failure Time model): B > 0 corresponds to slowing time and increased survival time, i.e. increased WTP; B< 0 to accelerating time and decreased survival time, i.e. decreased WTP; and B = 0 to no change.

Table 27 - Construct validity - future WTP (Weibull, upper bound)

Future WTP	Sample C				Sample A*				Sample C*			
	Specification 1		Specification 2		Specification 1		Specification 2		Specification 1		Specification 2	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Age	-1.58 ***	0.12	-1.56 ***	0.12	-1.63 ***	0.14	-1.62 ***	0.13	-1.59 ***	0.15	-1.58 ***	0.15
Age squared	0.02 ***	0.00	0.02 ***	0.00	0.02 ***	0.00	0.02 ***	0.00	0.02 ***	0.00	0.02 ***	0.00
Female (=1)	0.33 ***	0.10	0.32 ***	0.10	0.25 **	0.11	0.17	0.12	0.27 **	0.11	0.19	0.12
Household pc income (log)	0.29 ***	0.04	0.27 ***	0.04	0.19 ***	0.04	0.21 ***	0.05	0.20 ***	0.05	0.22 ***	0.05
Married (=1)	-0.08	0.12	-0.03	0.12	0.09	0.14	0.10	0.14	0.01	0.16	0.01	0.16
University education (=1)	0.46 ***	0.17	0.32 *	0.17	0.22	0.23	0.16	0.23	0.05	0.25	-0.03	0.25
Statd prob of living to 70	0.00	0.00	0.00	0.00	-0.01 ***	0.00	-0.01 ***	0.00	-0.01 **	0.00	-0.01 **	0.00
Very religious (=1)			-0.57 **	0.23			-0.47 *	0.25			-0.45	0.28
Smoker (=1)			-0.05	0.11			-0.19	0.12			-0.19	0.13
Own insurance (=1)			0.39 **	0.17			0.26	0.22			0.23	0.25
Heart disease (=1)			0.21	0.20			0.00	0.20			-0.03	0.22
Bronchitis (=1)			0.21	0.20			-0.21	0.26			-0.20	0.26
Asthma (=1)			-0.39 *	0.22			-0.08	0.24			-0.14	0.25
High blood pressure (=1)			0.13	0.12			0.16	0.14			0.15	0.15
Cancer (=1)			-0.15	0.39			-0.33	0.43			-0.12	0.47
Constant	42.06 ***	3.11	42.83 ***	3.06	44.30 ***	3.44	44.93 ***	3.40	43.41 ***	3.73	43.81 ***	3.66
Scale parameter	1.08	0.04	1.01	0.4	1.10	0.05	1.12	0.04	1.03	0.05	1.14	0.05
Number of observations	464		464		343		343		287		287	

Note: AFT (Accelerated Failure Time model): B > 0 corresponds to slowing time and increased survival time, i.e. increased WTP; B< 0 to accelerating time and decreased survival time, i.e. decreased WTP; and B = 0 to no change.

Table 28 - Confidence in Mexican and international institutions

	TOTAL (n=1,192)				COMPARATIVE (Latinobarometro)				Total	
	Much	**Some**	**Little**	**None**	**Much**	**Some**	**Little**	**None**	**Much/some**	**Little/none**
Churches	22.2%	45.6%	21.1%	11.2%	37.0%	26.9%	19.8%	15.2%	67.8%	32.2%
Mexican universities	22.5%	36.7%	26.0%	14.9%	45%^	31%^	16%^	10%^	59.1%	40.9%
US universities	23.2%	35.0%	21.7%	20.1%					58.1%	41.9%
Humanitarian NGOs	21.6%	35.1%	27.5%	15.8%	12%$	29%$	36%$	15%$	56.7%	43.3%
Environmental NGOs	16.8%	39.8%	25.8%	17.7%	12%$	29%$	36%$	15%$	56.6%	43.5%
Secretaria de Salud (Health Ministry)	21.56%	33.81%	22.48%	22.15%	3.6%*	21.3%*	33.8%*	37.8%*	55.4%	44.6%
Secretaria del Medio Ambiente (Environment Ministry)	15.1%	38.7%	25.0%	21.2%	3.6%*	21.3%*	33.8%*	37.8%*	53.8%	46.2%
Large companies	11.6%	29.4%	26.3%	32.8%	20%~	32%~	29%~	6%~	40.9%	59.1%
The press	6.5%	21.9%	37.3%	34.2%	7.0%	25.5%	36.2%	29.4%	28.4%	71.6%
The court system	5.0%	20.5%	34.6%	40.0%	6.3%	21.8%	30.4%	38.0%	25.4%	74.6%
The Federal Government	0.9%	15.8%	35.3%	48.0%	8.2%	25.5%	36.5%	28.4%	16.7%	83.3%
The police	0.8%	12.8%	37.5%	48.9%	7.1%	20.8%	35.1%	36.9%	13.6%	86.4%
Political parties	0.8%	9.2%	30.8%	59.1%	3.4%	19.0%	33.4%	42.8%	10.1%	89.9%

Note: * 'public administration' entry; ^ 'public universities' entry - note that in Mexico there are several large private universities, so the comparison is not like-for-like, source is Camara de Diputados document; ~ source is Camara de Diputados document; $ source is Camara de Diputados document - 'civil society organisations' entry, so again the comparison is not strictly like-for-like.

Table 29 - Confidence in institutions - construct validity

Contemporaneous WTP	Sample C								Sample A*								Sample C*							
	Specification 1				Specification 2				Specification 1				Specification 2				Specification 1				Specification 2			
	coefficient			s.e.	coefficient			s.e.	coefficient			s.e.	coefficient			s.e.	coefficient			s.e.	coefficient			s.e.
Age		0.01		0.05		0.01		0.05		-0.08		0.06		-0.06		0.06		-0.09		0.06		-0.07		0.06
Age squared		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Female (=1)		0.13		0.08		0.16	**	0.08		0.10		0.09		0.09		0.09		0.13		0.10		0.11		0.10
Household pc income (log)		0.27	***	0.03		0.26	***	0.03		0.24	***	0.04		0.23	***	0.04		0.22	***	0.04		0.21	***	0.04
Married (=1)		-0.14		0.09		-0.10		0.09		-0.31	***	0.11		-0.24	**	0.11		-0.31	**	0.12		-0.18		0.12
University education (=1)		0.44	***	0.13		0.43	***	0.13		0.36	*	0.19		0.25		0.19		0.33		0.22		0.18		0.21
Very religious (=1)		-0.58	***	0.19		-0.63	***	0.18		-0.70	***	0.21		-0.75	***	0.20		-0.67	***	0.23		-0.75	***	0.22
Smoker (=1)		0.09		0.08		0.05		0.08		-0.12		0.09		-0.18	*	0.09		-0.03		0.10		-0.12		0.10
Own insurance (=1)		0.42	***	0.12		0.39	***	0.12		0.04		0.15		0.05		0.15		-0.07		0.16		-0.07		0.16
HealthMin confidence						0.36	***	0.13						0.46	***	0.17						0.52	***	0.19
EnvMin confidence		0.40	***	0.09		0.31	**	0.13		0.54	***	0.13		0.27		0.17		0.59	***	0.14		0.33	*	0.18
HumanNGOs confidence						-0.48	***	0.14						-0.32	**	0.15						-0.40	**	0.16
MexUnis confidence						0.18		0.13						0.37	**	0.17						0.40	**	0.18
5 in 1,000 risk		-0.10		0.08		-0.07		0.07		-0.08		0.09		-0.03		0.08		-0.16	*	0.09		-0.10		0.09
Constant		4.97	***	1.32		5.14	***	1.31		8.02	***	1.64		7.67	***	1.57		8.36	***	1.76		7.94	***	1.69
Scale parameter		1.17		0.04		1.20		0.04		1.21		0.05		1.26		0.05		1.25		0.05		1.27		0.05
Number of observations		536				536				384				384				324				324		

Note: AFT (Accelerated Failure Time model): B > 0 corresponds to slowing time and increased survival time, i.e. increased WTP; B< 0 to accelerating time and decreased survival time, i.e. decreased WTP; and B = 0 to no change.

Annex 3.1 - Statistical tables

Table 30 - Socio-economic and health statistics

	FULL SAMPLE n = 3,501	Mexican university n = 480	Foreign university n = 428	Environment Ministry n = 433	Health Ministry n = 458	Blue IDB n = 460	Red IDB n = 419	Spanish IDB n = 408	Blank logo n =415
Age									
40-45	69.4%	71.0%	72.2%	70.9%	68.1%	67.6%	69.9%	68.4%	67.0%
46-50	30.6%	29.0%	27.8%	29.1%	31.9%	32.4%	30.1%	31.6%	33.0%
Income	187,555	215,552	190,647	169,774	163,771	205,776	184,786	187,841	179,108
Male	50.4%	52.5%	56.3%	51.0%	52.2%	45.9%	53.5%	47.3%	50.8%
Married	59.4%	59.8%	59.6%	57.0%	55.7%	56.5%	59.4%	64.2%	63.6%
University education	60.9%	63.1%	61.9%	59.6%	60.5%	60.7%	60.4%	62.0%	58.8%
Health									
has bad health	2.1%	1.0%	1.2%	2.6%	2.6%	3.3%	2.2%	2.5%	1.7%
family illness	68.9%	64.8%	65.9%	68.1%	69.2%	74.6%	68.7%	71.3%	68.7%
family cancer	27.5%	27.5%	28.5%	26.6%	26.9%	30.4%	27.9%	27.9%	23.6%
own illness	20.8%	17.9%	18.0%	21.5%	21.2%	23.0%	22.9%	21.3%	20.7%
own cancer	1.5%	1.3%	1.4%	2.3%	1.5%	2.4%	1.2%	1.2%	0.7%
visited emergencies in last 5 years	6.1%	6.5%	7.0%	8.1%	5.0%	4.8%	7.9%	4.7%	5.3%
visited hospital in last 5 years	5.1%	4.6%	4.7%	7.6%	5.0%	5.4%	5.3%	4.2%	3.6%

Note: for those that filled in the WTP questions.

Table 31 - Acceptance and understanding of the questionnaire scenarios

	Total	Mexican university	Foreign university	Environment Ministry	Health Ministry	Blue IDB	Red IDB	Spanish IDB	Blank logo
Did not believe risk applied to them	32.7%	33.5%	33.1%	32.8%	34.4%	34.4%	32.7%	30.7%	29.7%
• thought own risks to be higher	13.3%	9.9%	12.6%	14.0%	10.1%	13.1%	17.7%	17.0%	12.9%
• thought own risks to be lower	86.7%	90.1%	87.4%	86.0%	89.9%	86.9%	82.3%	83.0%	87.1%
Thought there would be side effects	26.0%	23.8%	27.7%	29.2%	23.8%	25.2%	29.7%	23.3%	25.8%
Doubted product would work	30.0%	30.1%	29.4%	33.6%	30.0%	29.6%	29.2%	30.4%	27.3%
Thought there would be other benefits to the product	32.8%	32.0%	36.5%	31.3%	32.7%	32.5%	34.2%	34.5%	29.3%
Failed to consider whether they could afford the product	12.9%	12.1%	11.9%	13.7%	13.3%	11.1%	12.6%	14.1%	14.8%
Did not understand they would have to pay once per year over 10 years	12.2%	11.9%	12.5%	13.7%	11.9%	10.5%	11.3%	11.4%	14.5%

Table 32 - Participants reaching the end of the questionnaire, per sponsor

Logo	Total	Reached the end (%)	
		n	%
Mexican university	557	495	88.9
Foreign university	509	437	85.9
Environment Ministry	520	440	84.6
Health Ministry	538	473	87.9
Blue IDB	546	474	86.8
Red IDB	505	438	86.7
Spanish IDB	493	429	87.0
Blank logo	507	430	84.8
Total	4,175	3,616	86.6

Table 33 – Incidence of missing answers for respondents that reached the end of the survey

Logo	Total	missing at least one answer		missing at least four answers		missing at least seven answers	
		n	%	n	%	n	%
Mexican university	495	150	30.2%	68	13.8%	59	11.9%
Foreign university	437	130	29.7%	58	13.3%	53	12.1%
Environment Ministry	440	126	28.6%	47	10.6%	43	9.7%
Health Ministry	473	136	28.8%	59	12.4%	54	11.4%
Blue IDB	474	143	30.2%	55	11.5%	45	9.6%
Red IDB	438	144	32.9%	59	13.4%	57	13.1%
Spanish IDB	429	141	32.8%	49	11.5%	39	9.1%
Blank logo	430	124	28.9%	38	8.9%	33	7.7%
Total	3,616	1,094	30.2%	433	12.0%	383	10.6%

Table 34 - Time spent on first WTP question (5 in 10,000 mortality risk reduction)

Logo	Total	Under 5 seconds		5 to 15 seconds		15 to 25 seconds		25 seconds to 2		Over 2 minutes	
		n	%	n	%	n	%	n	%	n	%
Mexican university	480	11	2.3%	34	7.1%	88	18.3%	322	67.1%	25	5.2%
Foreign university	428	13	3.0%	35	8.2%	69	16.1%	295	68.9%	16	3.7%
Environment Ministry	433	11	2.5%	42	9.7%	78	18.0%	284	65.6%	18	4.2%
Health Ministry	458	12	2.6%	30	6.6%	62	13.5%	329	71.8%	25	5.5%
Blue IDB	460	10	2.2%	25	5.4%	71	15.4%	340	73.9%	14	3.0%
Red IDB	419	10	2.4%	35	8.4%	70	16.7%	281	67.1%	23	5.5%
Spanish IDB	408	5	1.2%	30	7.4%	64	15.7%	293	71.8%	16	3.9%
Blank logo	415	13	3.1%	38	9.2%	63	15.2%	276	66.5%	25	6.0%
Total	3,501	85	2.4%	269	7.7%	565	16.1%	2,420	69.1%	162	4.6%

Note: of the respondents that reached the end of the survey 115 did not reply to the first WTP question.

Table 35 – Time spent to reach the end of the questionnaire

Logo	Obs.	Length (mins.)	
		Avg.	Std Dev.
Mexican university	465	27.7	14.1
Foreign university	410	27.0	13.6
Environment Ministry	406	28.0	14.5
Health Ministry	445	27.7	13.5
Blue IDB	442	26.5	12.5
Red IDB	401	27.0	13.8
Spanish IDB	387	27.5	13.8
Blank logo	398	26.4	13.6
Total	3,354	27.2	13.7

Note: drops incomplete surveys and observations with missing WTP data or missing socio-economic information (missing income, missing insurance status).

Annex 3.2 - Test results

Table 36 - participant engagement, comparison of means (t-tests)

	Completion rates	Item response rates	Time on WTP question	Time to end
Test 1				
Mexican Univ. Vs Health Min.	1.328	0.058	-1.458	0.204
Mexican Univ. Vs Env. Min.	2.035**	1.039	0.461	-0.123
Mexican Univ. Vs blue logo IDB	1.311	1.395	-2.547**	1.354
Mexican Univ. Vs red logo IDB	0.867	-1.053	-0.352	0.719
Mexican Univ. Vs Spanish logo IDB	1.355	0.906	-1.829*	0.183
Foreign Univ. Vs Health Min.	-0.600	0.064	-0.798	-0.432
Foreign Univ. Vs Env. Min.	0.690	1.022	1.058	-0.712
Foreign Univ. Vs blue logo IDB	0.983	1.370	-1.860*	0.684
Foreign Univ. Vs red logo IDB	-0.564	-0.965	0.3901	-0.010
Foreign Univ. Vs Spanish logo IDB	-0.085	0.938	-1.047	-0.533
Health Min. Vs blue logo IDB	0.692	1.326	-1.080	1.160
Health Min. Vs red logo IDB	0.047	-1.079	1.259	0.774
Health Min. Vs Spanish logo IDB	0.533	0.860	-0.216	0.232
Env. Min. Vs blue logo IDB	-0.619	0.328	-2.935***	1.410
Env. Min. Vs red logo IDB	-1.312	-2.041**	-0.318	0.978
Env. Min. Vs Spanish logo IDB	-0.831	-0.135	-1.746*	0.464
Test 2				
Mexican Univ. Vs Foreign Univ.	-1.328	0.007	0.627	-0.625
Test 3				
Env. Min. Vs Health Min.	-1.301	-0.974	-1.874*	0.317
Test 4				
Spanish logo Vs English logo (blue)	0.216	0.231	-0.700	0.950
Spanish logo Vs English logo (red)	0.186	-2.038**	1.516	0.485
Test 5				
Red logo IDB Vs blue logo IDB	-0.026	-2.326**	-2.259**	-0.440
Test 6				
Blank logo Vs Mexican Univ.	-2.329**	-1.875*	0.010	-1.180
Blank logo Vs Foreign Univ.	-0.983	-1.843*	-0.595	-0.560
Blank logo Vs Health Min.	-1.596	-1.805*	-1.397	-0.998
Blank logo Vs Env. Min.	-0.296	-0.830	0.454	-1.235
Blank logo Vs. blue logo IDB	-0.916	-0.518	-2.451**	0.075
Blank logo Vs. red logo IDB	-0.922	-2.766***	-0.193	-0.335
Blank logo Vs. Spanish logo IDB	-1.104	-0.732	-1.705*	-0.806

* significant at 10%; ** significant at 5%; *** significant at 1%.

Note: t-value for tests for difference in means, two-tailed, unpaired; a negative t-test for item response rates means that the average occurrence of missing data is lower in the first than in the second type of survey sponsor listed; item response rates - tests for at least 7 questions missing; time on WTP question - proportion of respondents spending 25 seconds to 2 minutes on the first WTP question; time to end - survey length in minutes for surveys taking less than an hour and a half.

Table 37 - Marginal effects for the Environment Ministry logo and the Health Ministry logo versus marginal effects for the other survey sponsor types

	Contemporaneous				Latent	
	WTP5		WTP10		WTP5	
	sample A	sample C	sample A	sample C	sample A	sample C
1. Without Environment and Health Ministry	2,522.7	2,348.6	2,975.0	3,014.7	2,508.1	2,487.7
2. Environment Ministry only	1,984.2	1,832.6	2,186.9	2,257.4	1,902.4	1,907.8
(difference to other sponsors)	*21.3%*	*22.0%*	*26.5%*	*25.1%*	*24.1%*	*23.3%*
3. Health Ministry only	2,210.8	2,036.6	2,557.8	2,543.0	2,145.4	2,063.9
(difference to other sponsors)	*12.4%*	*13.3%*	*14.0%*	*15.6%*	*14.5%*	*17.0%*

Note, dummies set as: 1. Environment Ministry= Health Ministry=0, others=1; 2. Environment Ministry=1, others=0; 3. Health Ministry=1, others=0.

Annex 3.3 – Logos

LSE THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

SALUD

SECRETARÍA DE SALUD

SEMARNAT

SECRETARÍA DE MEDIO AMBIENTE Y RECURSOS NATURALES

International Development Bank

International Development Bank

Banco Internacional para el Desarrollo

Annex 4.1 – Correlations

Table 38 – Correlation table for social capital variables (‘high correlation’ highlighted: greater than 0.5 or less than -0.5; continues in the next two pages)

		Socialising with friends	Socialising with co-workers	Socialising with neighbours	Borrow month's wage	Help with illness	Help find a job	Help to go to visit a doctor	Help to improve neighbourhood	Sports club	Political party	NGO	Cultural or social club	Religious organisation	Neighbourhood group
1	Socialising with friends	1.00													
	Socialising with co-workers	0.48	1.00												
	Socialising with neighbours	0.28	0.36	1.00											
2	Borrow month's wage	0.10	0.11	0.12	1.00										
	Help with illness	0.11	0.09	0.08	0.24	1.00									
	Help find a job	0.09	0.09	0.06	0.19	0.19	1.00								
	Help to go to visit a doctor	0.02	0.03	0.02	0.18	0.29	0.18	1.00							
	Help to improve neighbourhood	0.11	0.13	0.19	0.24	0.23	0.21	0.17	1.00						
3	Sports club	0.19	0.16	0.09	0.05	0.06	0.02	0.05	0.08	1.00					
	Political party	0.03	0.08	0.15	0.01	0.03	0.00	-0.02	0.06	0.12	1.00				
	NGO	0.15	0.15	0.13	0.04	0.04	0.00	0.00	0.05	0.16	0.27	1.00			
	Cultural or social club	0.21	0.24	0.17	0.07	0.01	0.04	0.03	0.06	0.40	0.16	0.27	1.00		
	Religious organisation	0.10	0.06	0.10	-0.01	0.02	0.00	0.00	0.02	0.16	0.12	0.13	0.20	1.00	
	Neighbourhood group	0.10	0.11	0.25	0.03	0.03	-0.01	0.01	0.11	0.20	0.22	0.20	0.28	0.28	1.00
	Parents or alumni association	0.13	0.14	0.16	0.02	0.02	0.01	-0.02	0.07	0.21	0.14	0.19	0.28	0.24	0.39
	Volunteering	0.16	0.16	0.20	0.03	0.06	0.01	-0.01	0.07	0.15	0.15	0.33	0.25	0.25	0.22

		Socialising with friends	Socialising with co-workers	Socialising with neighbours	Borrow month's wage	Help with illness	Help find a job	Help to go to visit a doctor	Help to improve neighbourhood	Sports club	Political party	NGO	Cultural or social club	Religious organisation	Neighbourhood group
4	Health Ministry	0.02	0.07	0.09	0.06	0.08	0.06	0.06	0.14	0.01	0.05	0.01	0.05	0.03	0.04
	Environment Ministry	0.04	0.07	0.11	0.06	0.05	0.07	0.04	0.13	0.00	0.04	0.03	0.06	0.06	0.03
	Environmental NGOs	0.11	0.06	0.09	0.07	0.07	0.08	0.05	0.13	0.07	0.03	0.12	0.10	0.11	0.11
	Humanitarian NGOs	0.13	0.07	0.11	0.07	0.05	0.08	0.04	0.12	0.09	0.02	0.14	0.11	0.20	0.14
	The church	0.02	0.01	0.10	0.03	0.05	0.05	0.02	0.07	0.01	0.02	-0.01	0.00	0.43	0.09
	The Federal Government	0.01	0.06	0.13	0.07	0.03	0.04	0.03	0.10	0.03	0.11	0.01	0.03	0.04	0.05
	Political parties	-0.02	0.07	0.14	0.03	0.01	0.03	-0.01	0.10	0.00	0.18	0.05	0.04	0.03	0.03
	Large corporations	0.06	0.10	0.07	0.06	0.07	0.08	0.05	0.12	0.11	-0.01	0.06	0.08	0.07	0.08
	The police	0.01	0.06	0.11	0.04	0.06	0.06	0.03	0.10	0.03	0.05	0.02	0.05	0.06	0.06
	Mexican universities	0.10	0.08	0.07	0.08	0.07	0.06	0.05	0.12	0.11	0.04	0.08	0.11	0.03	0.10
	U.S. universities	0.10	0.09	0.10	0.06	0.07	0.06	0.04	0.11	0.13	0.00	0.03	0.11	0.07	0.08
	The press	0.02	0.05	0.08	0.04	0.06	0.05	0.04	0.10	0.03	0.04	0.02	0.04	0.01	0.04
	Law courts	0.02	0.08	0.11	0.08	0.08	0.06	0.04	0.09	0.02	0.07	0.07	0.03	0.05	0.04
	Generalised trust	-0.13	-0.11	-0.14	-0.07	-0.07	-0.06	0.01	-0.11	-0.07	-0.03	-0.07	-0.06	-0.05	-0.08

		Health Ministry	Environment Ministry	Environmental NGOs	Humanitarian NGOs	The church	The Federal Government	Political parties	Large corporations	The police	Mexican universities	U.S. universities	The press	Law courts	Generalised trust
4	Health Ministry	1.00													
	Environment Ministry	0.67	1.00												
	Environmental NGOs	0.36	0.53	1.00											
	Humanitarian NGOs	0.30	0.38	0.65	1.00										
	The church	0.25	0.31	0.30	0.46	1.00									
	The Federal Government	0.42	0.38	0.17	0.16	0.21	1.00								
	Political parties	0.34	0.33	0.17	0.13	0.18	0.64	1.00							
	Large corporations	0.34	0.35	0.32	0.30	0.24	0.34	0.28	1.00						
	The police	0.41	0.37	0.24	0.23	0.24	0.56	0.51	0.38	1.00					
	Mexican universities	0.34	0.36	0.41	0.35	0.15	0.17	0.07	0.31	0.18	1.00				
	U.S. universities	0.23	0.33	0.34	0.35	0.16	0.11	0.06	0.33	0.11	0.58	1.00			
	The press	0.42	0.43	0.33	0.31	0.20	0.37	0.33	0.32	0.36	0.28	0.24	1.00		
	Law courts	0.41	0.39	0.26	0.22	0.21	0.52	0.47	0.37	0.68	0.22	0.17	0.37	1.00	
	Generalised trust	-0.11	-0.13	-0.19	-0.23	-0.15	-0.10	-0.09	-0.15	-0.15	-0.17	-0.11	-0.11	-0.13	1.00

Note: subsample C data; variables divided by 1) personal relationships; 2) social network support; 3) civic engagement; and 4) trust and cooperative norms.

Annex 4.2 – Descriptive statistics

Table 39 –Descriptive Statistics (continues in the next page)

		Full regression		Low income		High income		Miniaturised community		Traditionalists		Low social capita		High social capital	
		coefficient	s.d.	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.
1	Socialisation														
	Socialising with friends (=1)	0.53	0.50	0.42	0.49	0.66	0.47	0.73	0.44	0.48	0.50	0.59	0.49	0.59	0.49
	Socialising with co-workers (=1)	0.36	0.48	0.29	0.45	0.44	0.50	0.55	0.50	0.29	0.45	0.40	0.49	0.42	0.49
	Socialising with neighbours (=1)	0.15	0.36	0.13	0.34	0.18	0.38	0.26	0.44	0.09	0.29	0.20	0.40	0.17	0.37
2	Support from others														
	Borrow month's wage (=1)	0.43	0.49	0.33	0.47	0.48	0.50	0.55	0.50	0.43	0.49	0.53	0.50	0.45	0.50
	Help with illness (=1)	0.57	0.50	0.49	0.50	0.61	0.49	0.73	0.45	0.56	0.50	0.69	0.46	0.62	0.49
	Help find a job (=1)	0.60	0.49	0.53	0.50	0.67	0.47	0.77	0.42	0.62	0.49	0.70	0.46	0.65	0.48
	Help to go to visit a doctor (=1)	0.79	0.40	0.73	0.44	0.83	0.38	0.93	0.25	0.85	0.36	0.89	0.31	0.88	0.33
	Help to improve neighbourhood (=1)	0.44	0.50	0.39	0.49	0.51	0.50	0.61	0.49	0.40	0.49	0.54	0.50	0.47	0.50
3	Civic engagement														
	Sports club (=1)	0.16	0.37	0.12	0.33	0.29	0.46	0.31	0.46	0.00	0.00	0.00	0.00	0.32	0.47
	Political party (=1)	0.05	0.22	0.05	0.22	0.06	0.24	0.10	0.29	0.00	0.00	0.00	0.00	0.10	0.29
	NGO (=1)	0.06	0.23	0.04	0.21	0.10	0.30	0.12	0.33	0.00	0.00	0.00	0.00	0.10	0.30
	Cultural or social club (=1)	0.11	0.31	0.08	0.28	0.17	0.37	0.22	0.42	0.00	0.00	0.00	0.00	0.20	0.40
	Religious organisation (=1)	0.28	0.45	0.25	0.44	0.30	0.46	0.53	0.50	0.00	0.00	0.00	0.00	0.56	0.50
	Neighbourhood group (=1)	0.14	0.35	0.12	0.33	0.18	0.38	0.29	0.45	0.00	0.00	0.00	0.00	0.25	0.43
	Parents or alumni association (=1)	0.16	0.37	0.14	0.35	0.20	0.40	0.34	0.47	0.00	0.00	0.00	0.00	0.29	0.45
	Volunteering (=1)	0.21	0.41	0.20	0.40	0.26	0.44	0.39	0.49	0.09	0.28	0.11	0.31	0.27	0.45
4	Trust in institutions														
	Health Ministry	0.40	0.49	0.42	0.49	0.35	0.48	0.46	0.50	0.36	0.48	0.47	0.50	0.38	0.49
	Environment Ministry	0.38	0.48	0.39	0.49	0.34	0.47	0.46	0.50	0.34	0.48	0.43	0.50	0.35	0.48
	Environmental NGOs	0.59	0.49	0.53	0.50	0.64	0.48	0.75	0.44	0.50	0.50	0.63	0.48	0.57	0.50
	Humanitarian NGOs	0.62	0.48	0.54	0.50	0.71	0.45	0.80	0.40	0.51	0.50	0.67	0.47	0.62	0.49
	The Federal Government	0.12	0.33	0.13	0.34	0.11	0.31	0.16	0.37	0.09	0.28	0.16	0.37	0.12	0.33
	Political parties	0.05	0.22	0.08	0.27	0.03	0.18	0.06	0.24	0.04	0.19	0.09	0.28	0.03	0.18
	The police	0.12	0.33	0.14	0.35	0.09	0.28	0.19	0.39	0.10	0.29	0.19	0.39	0.10	0.30
	Law courts	0.17	0.38	0.17	0.38	0.14	0.35	0.24	0.43	0.13	0.34	0.23	0.42	0.16	0.36
	Mexican universities	0.83	0.38	0.75	0.43	0.89	0.32	0.90	0.30	0.77	0.42	0.84	0.36	0.83	0.37
	U.S. universities	0.77	0.42	0.65	0.48	0.85	0.36	0.84	0.36	0.69	0.46	0.76	0.43	0.80	0.40
	The Press (=1)	0.28	0.45	0.28	0.45	0.26	0.44	0.32	0.47	0.25	0.43	0.33	0.47	0.25	0.44
	Large companies (=1)	0.44	0.50	0.37	0.48	0.51	0.50	0.54	0.50	0.36	0.48	0.51	0.50	0.43	0.49
	The Church (=1)	0.50	0.50	0.49	0.50	0.49	0.50	0.68	0.47	0.39	0.49	0.50	0.50	0.54	0.50
	Generalised trust (=1)	0.63	0.48	0.65	0.48	0.59	0.49	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00

	Full regression		Low income		High income		Miniaturised community		Traditionalists		Low social capita		High social capital	
	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.	coefficient	s.d.
WTP for mortality risk reduction														
Contemporaneous 5 in 10,000	2,341	3,246	1,785	2,847	3,078	3,869	2,424	3,163	2,091	2,984	2,241	3,205	2,563	3,490
Contemporaneous 10 in 10,000	2,965	3,724	2,419	3,486	3,758	4,261	3,186	3,813	2,589	3,335	2,906	3,750	3,179	3,909
Latent (aged 70 to 80) 5 in 10,000	2,591	3,546	2,246	3,464	3,052	3,895	2,817	3,582	2,322	3,222	2,522	3,474	2,787	3,822
Age (years)	44.02	2.96	43.94	2.96	44.02	2.92	44.27	2.97	43.86	2.96	44.22	2.98	43.92	2.96
Female (=1)	0.49	0.50	0.55	0.50	0.44	0.50	0.48	0.50	0.53	0.50	0.52	0.50	0.46	0.50
Household pc income (MXN)	69,216	101,050	3,048	1,734	227,646	137,755	77,791	111,225	55,460	85,412	67,383	96,051	77,907	112,355
Married (=1)	0.60	0.49	0.59	0.49	0.60	0.49	0.59	0.49	0.57	0.50	0.60	0.49	0.63	0.48
University education (=1)	0.62	0.49	0.46	0.50	0.83	0.38	0.70	0.46	0.54	0.50	0.56	0.50	0.67	0.47
Very religious (=1)	0.17	0.37	0.15	0.36	0.21	0.40	0.17	0.37	0.17	0.38	0.19	0.39	0.15	0.36
Smoker (=1)	0.32	0.47	0.34	0.47	0.30	0.46	0.29	0.46	0.32	0.47	0.35	0.48	0.29	0.46
Own insurance (=1)	0.21	0.41	0.10	0.30	0.41	0.49	0.31	0.46	0.14	0.35	0.19	0.39	0.23	0.42
Heart disease (=1)	0.03	0.17	0.04	0.19	0.03	0.16	0.03	0.17	0.03	0.16	0.04	0.19	0.03	0.17
Bronchitis (=1)	0.04	0.20	0.04	0.20	0.02	0.14	0.04	0.21	0.04	0.20	0.02	0.14	0.05	0.21
Asthma (=1)	0.03	0.18	0.03	0.17	0.05	0.22	0.04	0.20	0.04	0.19	0.03	0.18	0.03	0.18
High blood pressure (=1)	0.14	0.35	0.15	0.36	0.13	0.33	0.14	0.35	0.15	0.36	0.13	0.34	0.13	0.34
Cancer (=1)	0.02	0.13	0.03	0.16	0.01	0.09	0.02	0.14	0.01	0.12	0.02	0.13	0.02	0.13
Hospital admission (=1)	0.05	0.21	0.06	0.24	0.05	0.21	0.05	0.22	0.03	0.17	0.04	0.20	0.07	0.26
Emergencies admission (=1)	0.06	0.23	0.07	0.25	0.05	0.23	0.06	0.24	0.05	0.21	0.05	0.22	0.07	0.26
Mexican university logo (=1)	0.14	0.34	0.13	0.33	0.17	0.37	0.12	0.33	0.13	0.33	0.16	0.37	0.14	0.35
Foreign university logo (=1)	0.12	0.33	0.13	0.33	0.12	0.33	0.13	0.34	0.11	0.32	0.11	0.31	0.12	0.33
Environment Ministry logo (=1)	0.12	0.33	0.13	0.34	0.11	0.31	0.09	0.29	0.13	0.34	0.15	0.36	0.12	0.33
Health Ministry logo (=1)	0.13	0.34	0.14	0.35	0.12	0.33	0.13	0.34	0.13	0.34	0.11	0.31	0.14	0.34
Blue Bank logo (=1)	0.13	0.34	0.11	0.32	0.15	0.36	0.16	0.36	0.13	0.34	0.12	0.33	0.13	0.34
Red Bank logo (=1)	0.12	0.33	0.11	0.32	0.12	0.32	0.12	0.33	0.12	0.33	0.12	0.32	0.11	0.31
Spanish Bank logo (=1)	0.12	0.32	0.12	0.32	0.12	0.32	0.13	0.33	0.13	0.33	0.11	0.32	0.11	0.31
Time on WTP5, over 25 secs (=1)	0.75	0.43	0.71	0.45	0.73	0.44	0.75	0.44	0.74	0.44	0.75	0.43	0.76	0.42
Time to completition (mins)	35.40	61.56	35.53	69.81	37.02	72.38	31.47	44.47	39.06	80.78	38.96	74.71	32.34	33.40
Doubted product would work (=1)	0.31	0.46	0.30	0.46	0.29	0.46	0.30	0.46	0.30	0.46	0.26	0.44	0.33	0.47
Risk doesn't apply to them (=1)	0.32	0.47	0.34	0.47	0.34	0.48	0.34	0.47	0.32	0.47	0.31	0.46	0.31	0.46
Didn't understand payment timing (=1)	0.12	0.32	0.14	0.35	0.12	0.33	0.11	0.32	0.11	0.31	0.13	0.34	0.12	0.32
Didn't think about ability to pay (=1)	0.12	0.33	0.14	0.35	0.12	0.32	0.12	0.33	0.14	0.35	0.11	0.31	0.11	0.31
Thought own risk of dying was higher (=1)	0.04	0.21	0.07	0.25	0.03	0.17	0.04	0.19	0.05	0.22	0.04	0.19	0.04	0.19
Thought about other benefits (=1)	0.35	0.48	0.29	0.46	0.38	0.49	0.39	0.49	0.33	0.47	0.33	0.47	0.35	0.48
Thought there would be side effects (=1)	0.26	0.44	0.29	0.45	0.26	0.44	0.22	0.41	0.26	0.44	0.25	0.43	0.28	0.45
Number of observations	2,814		648		595		578		892		473		871	

Note: subsample C data.

Annex 4.3 – Regressions

Table 40 – List and explanation of variables included in the initial regressions

1	Socialisation	Age (years)
	Socialising with friends (=1)	Female (=1)
	Socialising with co-workers (=1)	Household pc income (MXN, log)
	Socialising with neighbours (=1)	Married (=1)
		University education (=1)
2	Support from others (1=easy)	Very religious (=1)
	Borrow month's wage (=1)	Smoker (=1)
	Help with illness (=1)	Own insurance (=1)
	Help find a job (=1)	
	Help to go to visit a doctor (=1)	Heart disease (=1)
	Help to improve neighbourhood (=1)	Bronchitis (=1)
		Asthma (=1)
3	Civic engagement	High blood pressure (=1)
	Sports club member (=1)	Cancer (=1)
	Political party member (=1)	Hospital admission (=1)
	NGO member (=1)	Emergencies admission (=1)
	Cultural or social club member (=1)	
	Religious organisation member (=1)	Mexican university logo (=1)
	Neighbourhood group member (=1)	Foreign university logo (=1)
	Parents or alumni association member (=1)	Environment Ministry logo (=1)
		Health Ministry logo (=1)
	Volunteering in the past year (=1)	Red Bank logo (=1)
		Spanish Bank logo (=1)
4	Trust in institutions	
	Universities (=1)	Time on WTP5, over 25 secs (=1)
	Political parties, the police, law courts, and the Federal Government (=1)	Time to completion (mins)
	NGOs (=1)	Doubted product would work (=1)
	Government Ministries (=1)	Risk doesn't apply to them (=1)
	The Press (=1)	Didn't understand payment timing (=1)
	Large companies (=1)	Didn't think about ability to pay (=1)
	The Church (=1)	Thought own risk of dying was higher (=1)
		Thought about other benefits (=1)
	Generalised trust, tends to trust (=1)	Thought there would be side effects (=1)

Note: in the regression tables in the following pages: *** 1% significance; ** 5% significance; * 10% significance. Sample A excludes observations where both probability tests are wrong; sample C in addition excludes observations where WTP for a 5 in 10,000 mortality risk reduction is greater than WTP for a 10 in 10,000 mortality risk reduction and respondents stating that they do not understand probability well, and is the preferred sample.

Table 41 – Full regression results

	Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
1 Socialisation												
Socialising with friends (=1)												
Socialising with co-workers (=1)	242.3 *	138.1	310.7 **	128.9	256.8 *	140.0			323.7 **	141.5	338.7 **	147.0
Socialising with neighbours (=1)	294.1 *	177.5					325.4 *	193.4				
2 Support from others												
Borrow month's wage (=1)												
Help with illness (=1)												
Help find a job (=1)												
Help to go to visit a doctor (=1)					372.6 *	203.7	314.1 **	153.1	520.9 **	206.4	540.5 **	223.1
Help to improve neighbourhood (=1)												
3 Civic engagement												
Sports club (=1)												
Political party (=1)												
NGO (=1)												
Cultural or social club (=1)												
Religious organisation (=1)												
Neighbourhood group (=1)												
Parents or alumni association (=1)	340.1 **	173.0	305.6 *	171.2	437.6 **	187.4	440.7 **	197.8	496.3 ***	186.1	506.1 ***	193.8
Volunteering (=1)					-296.7 *	169.9	-316.7 *	179.2				
4 Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)	-131.1 ***	57.4			-153.1 **	62.1	-160.2 **	62.1				
Government Ministries (=1)											-121.9 **	60.6
The Press (=1)												
Large companies (=1)												
The Church (=1)			-325.6 **	141.4	-266.9 *	152.2						
Generalised trust (=1)												

	Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Age (years)	51.7 **	21.2	49.1 **	20.8					54.2 **	22.8	53.0 **	23.7
Female (=1)	-303.2 **	127.3	-369.0 ***	125.4	-450.8 ***	134.9	-491.5 ***	142.3	-305.2 **	137.7	-326.7 **	143.2
Household pc income (MXN, log)	242.2 ***	40.2	257.8 ***	40.2	247.8 ***	43.9	232.8 ***	46.4	154.8 ***	43.6	134.0 ***	45.7
Married (=1)												
University education (=1)												
Very religious (=1)	-476.9 ***	171.4	-539.7 ***	179.6	-497.2 **	194.3			-805.5 ***	184.8	-704.2 ***	192.1
Smoker (=1)	238.2 *	137.0	286.0 **	134.4	346.5 **	144.9	385.8 **	152.3	311.3 **	147.5	359.3 **	152.5
Own insurance (=1)					365.3 **	169.2	420.9 **	177.7				
Heart disease (=1)												
Bronchitis (=1)	621.8 **	316.4	666.2 **	313.8	635.0 *	335.9	809.0 **	357.6				
Asthma (=1)												
High blood pressure (=1)	314.1 *	180.1			412.7 **	190.4	425.4 **	202.4				
Cancer (=1)												
Hospital admission (=1)												
Emergencies admission (=1)												
Mexican university logo (=1)												
Foreign university logo (=1)			453.1 **	191.4	444.4 **	214.2	554.3 **	219.8				
Environment Ministry logo (=1)	-427.5 **	195.2			-600.8 ***	210.2	-410.7 *	215.4	-574.0 ***	210.1	-545.8 **	218.8
Health Ministry logo (=1)	-362.5 *	191.4			-361.1 *	206.1			-408.4 **	206.1	-511.6 **	215.4
Red Bank logo (=1)	-444.0 **	201.0			-408.6 *	216.4			-548.5 **	216.5	-458.3 **	222.9
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)	708.2 ***	145.9	799.8 ***	145.1	809.1 ***	154.8	897.4 ***	164.3	464.7 ***	157.7	508.9 ***	165.9
Time to completion (mins)												
Doubted product would work (=1)	-390.0 ***	136.5	-486.8 ***	134.7	-460.2 ***	144.4	-473.2 ***	153.0	-534.7 ***	147.3	-529.2 ***	153.4
Risk doesn't apply to them (=1)									264.6 *	153.4	286.2 *	159.5
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)	-850.5 ***	313.2	-896.6 ***	306.5	-1,061.8 ***	331.4	-1,100.6 ***	347.7	-897.0 **	353.9	-884.4 **	365.3
Thought about other benefits (=1)	-548.0 ***	133.9	-685.7 ***	130.9	-718.9 ***	141.4	-791.2 ***	149.0	-828.4 ***	144.4	-904.9 ***	149.3
Thought there would be side effects (=1)												
Constant	-2,488.2 **	1,025.2	-2,642.5 **	1,022.1	-23.8	501.0	-71.4	508.3	-1,781.4	1,110.4	-1,603.0 ***	1,164.0
Number of observations	3,077		2,803		3,077		2,803		3,077		2,803	

Table 42 - High income group regression results

	Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
1 Socialisation												
Socialising with friends (=1)												
Socialising with co-workers (=1)												
Socialising with neighbours (=1)												
2 Support from others												
Borrow month's wage (=1)	666.7 *	344.8	726.6 **	353.0								
Help with illness (=1)												
Help find a job (=1)												
Help to go to visit a doctor (=1)												
Help to improve neighbourhood (=1)												
3 Civic engagement												
Sports club (=1)									679.8 *	401.3	804.6 **	400.2
Political party (=1)	2,786.7 ***	721.8	2,990.4 ***	735.9	2,666.7 ***	765.8	2,596.5 ***	801.1	3,186.8 ***	742.9	2,749.9 ***	770.4
NGO (=1)												
Cultural or social club (=1)												
Religious organisation (=1)												
Neighbourhood group (=1)												
Parents or alumni association (=1)	860.3 **	433.0			1,257.7 ***	463.1	1,115.4 ***	477.2	857.3 *	456.5		
Volunteering (=1)												
4 Trust in institutions												
Universities (=1)			-292.6 *	173.6								
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)												
Government Ministries (=1)												
The Press (=1)												
Large companies (=1)												
The Church (=1)												
Generalised trust (=1)												

	Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Age (years)												
Female (=1)												
Household pc income (MXN, log)			791.9 **	385.1			949.8 ***	412.0				
Married (=1)												
University education (=1)												
Very religious (=1)												
Smoker (=1)												
Own insurance (=1)	862.0 **	351.6	870.0 **	354.9	1,169.0 ***	374.0	1,138.0 ***	385.1	1,054.1 ***	362.8	1,181.0 ***	367.8
Heart disease (=1)	-2,414.7 *	1,328.1	-2,236.8 *	1,303.5					-2,882.4 **	1,339.5	-3,659.7 ***	1,375.6
Bronchitis (=1)	3,019.5 **	1,340.0	2,814.9 **	1,392.0								
Asthma (=1)	-1,476.3 *	786.6	-1,354.3 *	803.1	-1,394.0 *	826.9						
High blood pressure (=1)												
Cancer (=1)											3,864.6 **	1,909.5
Hospital admission (=1)												
Emergencies admission (=1)												
Mexican university logo (=1)												
Foreign university logo (=1)	1,009.9 *	518.7	1,171.1 **	518.9	1,106.2 **	555.1	1,284.6 ***	564.3	1,249.8 **	532.9	1,288.8 **	535.1
Environment Ministry logo (=1)												
Health Ministry logo (=1)												
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)	1,115.5 ***	385.2	1,079.9 ***	398.9	1,069.6 **	411.2	1,085.4 ***	431.8	849.1 **	401.3	853.6 **	416.3
Time to completition (mins)			-4.4 *	2.5			-5.4 ***	2.7			-4.9 *	2.6
Doubted product would work (=1)											-699.2 *	407.5
Risk doesn't apply to them (=1)												
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)									-1,109.9 **	552.8		
Thought own risk of dying was higher (=1)							-1,865.8 *	1,077.7				
Thought about other benefits (=1)	-1,159.3 ***	355.0	-1,140.6 ***	359.0	-1,137.0 ***	377.7	-1,209.3 ***	386.7	-1,635.7 ***	367.7	-1,634.7 ***	374.0
Thought there would be side effects (=1)	-837.3 **	383.1	-902.7 **	397.0	-984.7 **	408.9	-996.3 ***	428.8	-800.4 **	396.0	-835.6 **	422.1
Constant	1,818.6 ***	456.5	-7,750.9	4,751.1	2,638.9 ***	447.2	-8,766.1 ***	5,115.6	2,097.5 ***	449.5	2,356.4 ***	468.9
Number of observations	565		527		565		527		565		527	

Table 43 - Low income group regression results

		Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
		Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
		coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
1	**Socialisation**												
	Socialising with friends (=1)												
	Socialising with co-workers (=1)												
	Socialising with neighbours (=1)					-621.5 *	374.2						
2	**Support from others**												
	Borrow month's wage (=1)											-530.2 *	317.8
	Help with illness (=1)			-446.6 *	267.2								
	Help find a job (=1)	577.7 **	250.8	435.1 *	260.6								
	Help to go to visit a doctor (=1)			760.8 **	344.0	626.8 *	334.0	750.3 **	373.3	605.4 *	350.9	821.8 **	393.2
	Help to improve neighbourhood (=1)												
3	**Civic engagement**												
	Sports club (=1)												
	Political party (=1)			-988.0 *	556.6			-1,258.3 *	689.5				
	NGO (=1)					1,554.7 **	667.4	1,635.9 **	734.7				
	Cultural or social club (=1)									1,085.5 **	514.0	1,090.4 **	550.5
	Religious organisation (=1)												
	Neighbourhood group (=1)												
	Parents or alumni association (=1)												
	Volunteering (=1)												
4	**Trust in institutions**												
	Universities (=1)												
	Political parties, the police, law courts, and the Federal Government (=1)			191.0 **	86.5								
	NGOs (=1)												
	Government Ministries (=1)												
	The Press (=1)												
	Large companies (=1)			484.0 ***	265.4								
	The Church (=1)					524.8 **	265.1	664.9 **	288.1	684.5 **	278.0	576.4 *	296.7
	Generalised trust (=1)												

	Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Age (years)												
Female (=1)			-509.3 ***	237.8	-480.2 *	268.3	-669.3 **	288.9	-610.6 **	280.8	-806.6 ***	300.7
Household pc income (MXN, log)												
Married (=1)												
University education (=1)					-501.6 *	266.0			-775.3 ***	280.8	-855.9 ***	299.7
Very religious (=1)												
Smoker (=1)												
Own insurance (=1)												
Heart disease (=1)					1,209.5 *	706.3	1,509.5 **	749.6				
Bronchitis (=1)	1,135.9 *	591.4	1,502.5 **	596.8			1,365.2 *	723.4				
Asthma (=1)												
High blood pressure (=1)												
Cancer (=1)												
Hospital admission (=1)												
Emergencies admission (=1)												
Mexican university logo (=1)												
Foreign university logo (=1)									-885.3 **	437.5	-1,243.7 **	483.2
Environment Ministry logo (=1)							-875.2 *	454.9	-863.4 *	445.4	-1,152.1 **	482.6
Health Ministry logo (=1)	-832.3 **	351.4	-987.6 ***	345.4	-1,009.4 ***	379.2	-1,430.9 ***	430.3	-1,393.4 ***	416.0	-1,933.0 ***	460.9
Blue Bank logo (=1)							-913.0 *	470.4			-1,208.4 **	499.3
Red Bank logo (=1)			-653.7 *	384.7	-997.0 **	426.3	-1,455.8 ***	480.2	-1,322.4 ***	464.8	-1,789.7 ***	508.2
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)												
Doubted product would work (=1)												
Risk doesn't apply to them (=1)					-550.4 *	281.0			-563.6 *	313.3		
Didn't understand payment timing (=1)	-822.5 **	360.2	-795.5 **	349.2	-1,085.7 ***	388.1	-973.3 **	425.5	-854.8 **	410.0	-927.3 **	440.3
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)												
Thought there would be side effects (=1)												
Constant	1,677.1 ***	209.5	1,420.6 ***	347.1	2,512.1 ***	410.4	2,313.3 ***	436.1	2,633.0 ***	434.0	3,099.5 ***	496.4
Number of observations	668		581		668		581		668		581	

Table 44 - 'Miniaturised community' group regression results

		Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
		Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
		coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
1	**Socialisation**												
	Socialising with friends (=1)					702.6 **	341.7	813.9 **	362.4				
	Socialising with co-workers (=1)												
	Socialising with neighbours (=1)												
2	**Support from others**												
	Borrow month's wage (=1)									701.5 **	297.6	788.6 **	307.5
	Help with illness (=1)												
	Help find a job (=1)												
	Help to go to visit a doctor (=1)			1,254.0 **	531.4	1,077.4 *	572.2	1,312.7 **	634.1			1,094.6 *	601.6
	Help to improve neighbourhood (=1)			465.9 *	272.8	604.3 *	308.1	706.8 **	325.6				
3	**Civic engagement**												
	Sports club (=1)												
	Political party (=1)												
	NGO (=1)												
	Cultural or social club (=1)												
	Religious organisation (=1)												
	Neighbourhood group (=1)												
	Parents or alumni association (=1)												
	Volunteering (=1)												
4	**Trust in institutions**												
	Universities (=1)												
	Political parties, the police, law courts, and the Federal Government (=1)	227.7 **	106.4	227.5 **	101.6								
	NGOs (=1)											-231.4 *	136.2
	Government Ministries (=1)												
	The Press (=1)	834.2 ***	320.5	824.6 ***	302.1			706.1 **	337.5				
	Large companies (=1)												
	The Church (=1)	-632.4 *	346.4	-535.6 *	324.1								
	Generalised trust (=1)												

	Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Age (years)												
Female (=1)												
Household pc income (MXN, log)	296.7 ***	91.2	265.0 ***	86.8	239.3 **	99.4	177.7 *	105.0				
Married (=1)			-497.5 *	272.3					559.0 *	301.1		
University education (=1)												
Very religious (=1)	-774.2 *	425.2	-742.8 *	401.6								
Smoker (=1)												
Own insurance (=1)												
Heart disease (=1)									1,747.4 **	832.1	1,703.3 **	864.0
Bronchitis (=1)												
Asthma (=1)												
High blood pressure (=1)					809.5 *	423.8						
Cancer (=1)												
Hospital admission (=1)												
Emergencies admission (=1)	988.0 *	560.7										
Mexican university logo (=1)			848.0 **	414.1								
Foreign university logo (=1)			846.2 **	398.7	882.3 *	449.0	857.7 *	465.3				
Environment Ministry logo (=1)												
Health Ministry logo (=1)									-826.9 *	427.4	-1,304.4 ***	455.7
Red Bank logo (=1)									-874.3 *	454.6	-937.9 **	465.2
Spanish Bank logo (=1)			731.0 *	404.4								
Time on WTP5, over 25 secs (=1)	578.2 *	321.9										
Time to completition (mins)												
Doubted product would work (=1)	-499.8 *	302.2	-791.9 ***	286.7	-775.8 **	324.3	-962.6 ***	344.3	-674.1 **	321.1	-839.6 **	333.5
Risk doesn't apply to them (=1)			-557.3 **	279.0	-595.2 *	316.1	-798.4 **	333.2				
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)	-1,012.1 ***	293.6	-874.6 ***	276.7	-822.5 ***	313.8	-858.0 ***	328.2	-1,354.2 ***	306.0	-1,398.2 ***	313.5
Thought there would be side effects (=1)												
Constant	-79.2	1,030.4	-793.5	1,030.2	-760.4	1,113.0	-425.7	1,186.4	2,830.4 ***	337.7	2,085.0 ***	627.8
Number of observations	628.0		576.0		628.0		576.0		628.0		576.0	

Table 45 - Traditionalist group regression results

	Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
1 Socialisation												
Socialising with friends (=1)												
Socialising with co-workers (=1)	608.5 ***	229.4	440.1 *	226.3			415.7 *	248.4	413.5 *	246.6	458.8 *	253.5
Socialising with neighbours (=1)												
2 Support from others												
Borrow month's wage (=1)												
Help with illness (=1)												
Help find a job (=1)												
Help to go to visit a doctor (=1)			523.1 *	288.8	570.2 *	293.6	635.5 **	315.4	842.3 ***	306.3	806.0 **	320.9
Help to improve neighbourhood (=1)												
3 Civic engagement												
Sports club (=1)												
Political party (=1)												
NGO (=1)												
Cultural or social club (=1)												
Religious organisation (=1)												
Neighbourhood group (=1)												
Parents or alumni association (=1)												
Volunteering (=1)	-736.7 **	373.9	-893.1 **	361.3	-1,017.4 ***	379.8	-1,190.7 ***	397.4	-844.3 **	396.6	-908.4 **	406.9
4 Trust in institutions												
Universities (=1)					-195.1 *	104.9	-236.8 **	109.5				
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)					-187.0 *	107.6	-235.8 **	113.4				
Government Ministries (=1)	-304.8 ***	92.7	-224.9 **	91.9					-201.4 **	99.6	-218.9 **	103.3
The Press (=1)												
Large companies (=1)												
The Church (=1)												
Generalised trust (=1)												

	Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Age (years)	79.7 **	35.0	63.4 *	34.3	66.9 *	35.6	66.0 *	37.7			68.2 *	38.5
Female (=1)			-412.3 **	206.0	-420.4 *	216.1	-458.7 **	227.0	-553.6 **	227.0	-553.4 **	231.0
Household pc income (MXN, log)	108.4 *	63.7	122.0 *	64.0	132.3 **	66.7						
Married (=1)					-484.8 **	217.1			-452.0 **	229.2		
University education (=1)												
Very religious (=1)	-525.1 *	283.4	-555.9 **	273.1	-595.7 **	285.9	-531.1 *	296.1	-1,120.8 ***	303.3	-978.3 ***	306.9
Smoker (=1)			367.0 *	217.6	492.0 **	228.5	601.8 **	239.0	474.2 **	240.4	641.1 ***	244.8
Own insurance (=1)												
Heart disease (=1)												
Bronchitis (=1)	1,472.7 ***	511.6	1,472.8 ***	504.7	1,138.7 **	523.1	1,325.0 **	556.2				
Asthma (=1)												
High blood pressure (=1)												
Cancer (=1)	-1,736.8 *	953.4	-1,648.7 *	881.5	-1,624.1 *	973.5	-1,711.0 *	972.5				
Hospital admission (=1)					-938.7 *	486.2						
Emergencies admission (=1)	-892.4 *	476.2										
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)					-548.0 *	318.0						
Health Ministry logo (=1)	-602.9 *	313.8			-546.7 *	322.4						
Red Bank logo (=1)	-650.1 **	320.1			-856.2 **	330.0	-574.5 *	340.2	-657.7 *	338.0		
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)	592.9 **	237.1	683.6 ***	235.3	656.0 ***	242.1	657.8 **	259.5				
Time to completition (mins)	-2.8 *	1.6			-2.8 *	1.6						
Doubted product would work (=1)												
Risk doesn't apply to them (=1)												
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)	-1,037.4 **	477.7	-934.9 **	458.3	-1,054.8 **	483.5	-973.0 *	500.7				
Thought about other benefits (=1)			-599.7 ***	217.5	-573.1 **	226.2	-702.0 ***	238.3	-513.9 **	237.4	-664.4 ***	243.9
Thought there would be side effects (=1)												
Constant	-2,522.9	1,681.2	-2,571.6	1,683.1	-1,452.7	1,755.9	-831.4	1,714.0	2,255.2 ***	376.1	-1,095.3	1,744.5
Number of observations	1,002		888		1,002		888		1,002		888	

Table 46 - High social capital group regression results

	Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
1 Socialisation												
Socialising with friends (=1)												
Socialising with co-workers (=1)												
Socialising with neighbours (=1)	737.3 **	321.3										
2 Support from others												
Borrow month's wage (=1)												
Help with illness (=1)	-440.8 *	251.6	-555.3 **	259.5	-565.3 **	279.8	-586.1 **	291.0				
Help find a job (=1)			512.6 *	262.5	612.5 **	283.6	657.0 **	294.5				
Help to go to visit a doctor (=1)												
Help to improve neighbourhood (=1)												
3 Civic engagement												
Sports club (=1)												
Political party (=1)									932.0 **	438.9	546.3 *	302.0
NGO (=1)												
Cultural or social club (=1)												
Religious organisation (=1)												
Neighbourhood group (=1)											678.1 **	318.8
Parents or alumni association (=1)									547.1 *	290.8		
Volunteering (=1)												
4 Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)											-224.9 **	107.0
NGOs (=1)												
Government Ministries (=1)												
The Press (=1)												
Large companies (=1)												
The Church (=1)												
Generalised trust (=1)												

	Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Age (years)	80.1 *	40.8	67.5 *	40.3					78.7 *	45.0		
Female (=1)					-441.7 *	258.5						
Household pc income (MXN, log)	382.3 ***	79.2	433.9 ***	79.6	412.2 ***	84.5	421.5 ***	89.2	267.4 ***	87.9	285.5 ***	92.5
Married (=1)												
University education (=1)												
Very religious (=1)												
Smoker (=1)	538.0 **	264.8	622.6 **	261.6	770.2 ***	282.5	825.4 ***	293.5	490.2 *	293.1		
Own insurance (=1)									539.6 *	322.9		
Heart disease (=1)												
Bronchitis (=1)												
Asthma (=1)												
High blood pressure (=1)			709.1 **	354.0			759.0 *	396.5				
Cancer (=1)												
Hospital admission (=1)												
Emergencies admission (=1)												
Mexican university logo (=1)												
Foreign university logo (=1)			764.2 **	365.4			793.4 *	410.1				
Environment Ministry logo (=1)												
Health Ministry logo (=1)												
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)	640.5 **	282.0	925.4 ***	282.9	957.9 ***	301.2	1,080.2 ***	317.4	722.7 **	312.1	907.2 ***	330.0
Time to completition (mins)												
Doubted product would work (=1)	-530.9 **	258.1	-577.4 **	254.6	-510.9 *	273.4	-513.8 ***	285.6	-759.6 ***	284.1	-718.7 **	297.0
Risk doesn't apply to them (=1)									686.9 **	302.3	788.8 **	316.3
Didn't understand payment timing (=1)	-704.5 *	368.3	-772.3 **	369.1			-937.1 ***	414.2				
Didn't think about ability to pay (=1)					-953.4 **	391.8						
Thought own risk of dying was higher (=1)									-1,332.7 *	704.0	-1,338.2 *	746.6
Thought about other benefits (=1)	-459.4 *	254.9	-615.2 **	252.0	-564.9 **	271.9	-666.0 **	282.6	-688.1 **	284.4	-831.5 ***	293.5
Thought there would be side effects (=1)												
Constant	-4,949.4 **	1,969.9	-5,571.6 ***	1,965.6	-1,531.5	934.0	-2,104.3 **	976.3	-4,405.0 **	2,183.9	-1,108.0	1,008.2
Number of observations	934		868		934		868		934		868	

Table 47 - Low social capital group regression results

	Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
1 Socialisation												
Socialising with friends (=1)												
Socialising with co-workers (=1)	533.4 *	303.1	691.2 **	303.9	691.9 **	338.5	644.1 *	357.2	571.5 *	325.9		
Socialising with neighbours (=1)												
2 Support from others												
Borrow month's wage (=1)												
Help with illness (=1)												
Help find a job (=1)												
Help to go to visit a doctor (=1)												
Help to improve neighbourhood (=1)												
3 Civic engagement												
Sports club (=1)												
Political party (=1)												
NGO (=1)												
Cultural or social club (=1)												
Religious organisation (=1)												
Neighbourhood group (=1)												
Parents or alumni association (=1)												
Volunteering (=1)												
4 Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)			-237.2 **	117.2	-245.7 *	127.7	-248.2 *	138.7				
NGOs (=1)												
Government Ministries (=1)			345.4 **	143.6	350.2 **	156.8	348.2 **	166.7				
The Press (=1)									-685.9 **	341.2		
Large companies (=1)												
The Church (=1)												
Generalised trust (=1)												

	Contemporaneous WTP_5				Contemporaneous WTP_10				Latent WTP_5			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Age (years)	98.5 **	48.8										
Female (=1)	-818.2 ***	295.2	-621.6 **	298.2	-584.6 *	329.4	-643.1 *	349.3				
Household pc income (MXN, log)	217.5 **	96.1	191.0 **	96.7	251.4 **	106.7			257.9 **	103.9	204.8 *	106.9
Married (=1)											-663.2 **	336.3
University education (=1)												
Very religious (=1)			-727.8 *	391.5					-1,113.4 ***	411.7	-1,138.4 ***	428.1
Smoker (=1)												
Own insurance (=1)							971.9 **	445.3				
Heart disease (=1)					1,454.5 *	881.6						
Bronchitis (=1)												
Asthma (=1)												
High blood pressure (=1)												
Cancer (=1)			2,103.8 *	1,133.3					2,728.7 **	1,279.5		
Hospital admission (=1)												
Emergencies admission (=1)											-1,625.7 **	744.0
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)									-1,174.6 **	452.4	-990.9 **	462.0
Health Ministry logo (=1)												
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)	1,347.6 ***	339.0	1,443.8 ***	346.8	1,435.9 ***	379.4	1,554.7 ***	408.2	942.6 **	366.9	928.0 **	379.8
Time to completition (mins)												
Doubted product would work (=1)									-782.6 **	364.1		
Risk doesn't apply to them (=1)												
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)	-1,752.2 **	814.5	-1,707.2 **	787.5	-2,300.5 **	910.3	-2,535.1 ***	932.2			-1,528.5 *	865.6
Thought about other benefits (=1)	-732.6 **	313.6	-619.7 *	317.0	-882.5 **	350.4	-858.1 **	373.0	-1,002.7 ***	343.4	-1,049.6 ***	348.7
Thought there would be side effects (=1)	-699.4 **	340.5	-600.4 *	340.5	-674.3 *	378.1						
Constant	-4,633.1 **	2,350.2	-331.8	1,048.8	-391.6	1,145.0	1,905.3 ***	459.2	-123.8	1,105.4	783.5	1,171.1
Number of observations	513		471		513		471		513		471	

Annex 5.1 – Descriptive statistics

	Variable	Code	PM 10		PM 2.5		O3	
			Mean	St. Deviation	Mean	St. Deviation	Mean	St. Deviation
Dependent variable (transformed into log)	Rent as reported by tenants pr year (MXN)	renta	26,237	27,735	26,028	23,288	25,659	28,165
Neighbourhood quality	Average of daily averages of PM10 (µg/m³)	PM10AVG	49.65	6.88				
	Average of daily averages of PM 2.5 (µg/m³)	PM25AVG			25.08	2.61		
	Average of daily averages of O3 (ppb)	O3AVG					26.88	2.28
	Population in neighbourhood with university education (%)	EDUSUP25	0.30	0.18	0.32	0.17	0.29	0.18
	Murder rate (per 1000,000)	MURDER_0	23.26	6.61	24.49	6.16	23.20	6.32
Property structure								
	Number of rooms	cuart	3.39	1.54	3.49	1.56	3.31	1.57
	Dummy for material roofs are made, 1=roof tiles, 0=other	techosD	0.89	0.31	0.91	0.29	0.88	0.32
	Dummy for material most of the flooring is made of, 1=linoleum, tiles, parquet or other covering, 0=cement, dirt floor	pisosD	0.57	0.50	0.63	0.48	0.54	0.50
	Dummy for public water network connection inside the property, 1=yes	dis_aguaD	0.82	0.38	0.84	0.36	0.79	0.41
	Dummy for shared toilet with another family, 1=no	uso_comD	0.86	0.35	0.89	0.32	0.84	0.37
	Dummy for water tank on the ground, 1=yes	cisteD	0.59	0.49	0.66	0.47	0.58	0.49
	Dummy for fixed gas tank, 1=yes	tan_gasD	0.20	0.40	0.22	0.41	0.19	0.40
	Dummy for room in which to cook, 1=yes	cua_cocD	0.94	0.24	0.95	0.21	0.94	0.25
	Dummy for water boiler, 1=yes	calenD	0.71	0.45	0.76	0.43	0.69	0.47
	Dummy for material walls are made of, 1=bricks, cement blocks, stone or concrete, 0=other	paredD	0.98	0.15	0.98	0.15	0.98	0.15
	Dummy for days per week property has access to water, 1=daily	dot_aguaD	0.84	0.37	0.88	0.32	0.80	0.40
	Dummy for direct water discharge, 1 = yes	adm_agD	0.80	0.40	0.84	0.37	0.78	0.42
	Dummy for public sewage network connection, 1=yes	drenajeD	0.99	0.11	1.00	0.06	0.98	0.13
	Dummy for public waste collection or waste containers available, 1=yes	eli_baD	0.99	0.10	0.98	0.12	0.99	0.09
	Dummy for area to wash clothes within the property, 1=yes	lavadD	0.92	0.27	0.90	0.31	0.92	0.27
	Dummy for sink to wash dishes, 1=yes	fregadD	0.66	0.47	0.71	0.46	0.63	0.48
	Dummy for shower, 1=yes	regadD	0.74	0.44	0.79	0.41	0.71	0.45
	Dummy for water tank on the roof, 1=yes	tin_azoD	0.73	0.44	0.77	0.42	0.71	0.45
	Dummy for wash basin, 1=yes	piletaD	0.29	0.45	0.28	0.45	0.30	0.46
	Dummy for water pump, 1=yes	bom_agD	0.63	0.48	0.72	0.45	0.61	0.49
Accessibility	Less than 3 Km from the airport	D_AIRP3km	0.05	0.22	0.09	0.29	0.05	0.22
	Between 3 and 5 Km from the airport	D_AIRP3to5km	0.11	0.32	0.19	0.39	0.11	0.31
	Distance from Santa Fe (business district)	Dst_SantaFe	15.85	6.90	15.27	5.67	15.36	7.08
	Distance from Zocalo (historic centre)	Dst_Zocalo	10.64	5.60	7.31	3.70	11.12	5.92
	Closest public square (Km)	PUBLICSQ	1.24	0.99	1.21	0.86	1.25	0.99
	Closest religious building (Km)	RELIGBLDG	0.21	0.14	0.20	0.13	0.21	0.14
	Closest shopping centre (Km)	SHOPCENT	3.52	2.60	3.24	2.40	4.03	3.13
	Closest green space (Km)	GREENAREA	1.00	0.96	0.90	0.85	1.03	1.06
	Closest closest medical facility (Km)	MEDICSERV	1.65	1.12	1.35	0.73	1.91	1.62
	Closest school (Km)	SCHOOL	0.92	0.94	0.68	0.62	1.27	1.55
	Closest underground station (Km)	UNDERGSTN	2.83	2.70	1.58	1.03	3.03	2.75
	Closest market (Km)	MARKET	1.45	1.11	1.23	0.90	1.73	1.51
	Closest sports and recreation facility (Km)	SPORTSREC	1.56	1.09	1.40	0.92	1.68	1.27
Location in the city	Centre dummy	city_z1	0.24	0.43	0.40	0.49	0.22	0.42
	Northeast dummy	city_z2	0.17	0.38	0.17	0.38	0.13	0.34
	Northwest dummy	city_z3	0.22	0.41	0.25	0.43	0.23	0.42
	Southeast dummy	city_z4	0.18	0.39	0.09	0.29	0.21	0.41
	Southwest dummy	city_z5	0.19	0.39	0.08	0.28	0.20	0.40
Number of observations			1,557		922		1,648	

Annex 5.2 – Moran's I test of spatial dependence – spatial dependence in the observables (2006 data)

Moran's I	Variable	Code	PM10		PM2.5		O3	
			I	p-value	I	p-value	I	p-value
Dependent variable (transformed into log)	Rent as reported by tenants per year (MXN)	renta	0.41	0.00	0.54	0.00	0.56	0.00
Neighbourhood quality	PM 10 (average of daily averages)	PM10AVG	0.95	0.00	0.92	0.00	0.94	0.00
	PM 2.5 (average of daily averages)		0.83	0.00	0.70	0.00	0.80	0.00
	O3 (average of daily averages)		0.87	0.00	0.67	0.00	0.89	0.00
	Population in neighbourhood with university education (%)	EDUSUP25						
	Murder rate (per 1000,000)	MURDER_0	0.29	0.00	0.21	0.00	0.18	0.00
			0.26	0.00	0.02	0.28	0.06	0.06
Property structure	Number of rooms	cuart	0.34	0.00	0.27	0.00	0.13	0.00
	Dummy for material roofs are made, 1=roof tiles, 0=other	techosD	0.40	0.00	0.21	0.00	0.17	0.00
	Dummy for material most of the flooring is made of, 1=linoleum, tiles, parquet or other covering, 0=cement, dirt floor	pisosD	0.07	0.10	0.12	0.00	0.12	0.00
	Dummy for public water network connection inside the property, 1=yes	dis_aguaD	0.26	0.00	0.16	0.00	0.23	0.00
	Dummy for shared toilet with another family, 1=no	uso_comD	0.22	0.00	0.20	0.00	0.24	0.00
	Dummy for water tank on the ground, 1=yes	cisteD	0.00	0.49	0.05	0.12	0.01	0.35
	Dummy for fixed gas tank, 1=yes	tan_gasD	0.30	0.00	0.13	0.00	0.30	0.00
	Dummy for room in which to cook, 1=yes	cua_cocD	-0.01	0.42	0.19	0.00	0.08	0.02
	Dummy for water boiler, 1=yes	calenD	0.39	0.00	0.22	0.00	0.22	0.00
	Dummy for material walls are made of, 1=bricks, cement blocks, stone or concrete, 0=other	paredD	0.16	0.00	0.09	0.01	0.17	0.00
	Dummy for days per week property has access to water, 1=daily	dot_aguaD	0.42	0.00	0.02	0.33	0.03	0.18
	Dummy for direct water discharge, 1 = yes	adm_agD	-0.01	0.49	0.00	0.46	-0.01	0.37
	Dummy for public sewage network connection, 1=yes	drenajeD	0.07	0.13	0.13	0.00	0.09	0.01
	Dummy for public waste collection or waste containers available, 1=yes	eli_baD	0.26	0.00	0.22	0.00	0.24	0.00
	Dummy for area to wash clothes within the property, 1=yes	lavadD	0.24	0.00	0.16	0.00	0.26	0.00
	Dummy for sink to wash dishes, 1=yes	fregadD	0.15	0.01	0.12	0.00	0.14	0.00

	Variable	Code	PM10		PM2.5		O3	
			I	p-value	I	p-value	I	p-value
	Dummy for shower, 1=yes	regadD	0.24	0.00	0.16	0.00	0.26	0.00
	Dummy for water tank on the roof, 1=yes	tin_azoD	0.15	0.01	0.12	0.00	0.14	0.00
	Dummy for wash basin, 1=yes	piletaD	0.17	0.00	0.12	0.00	0.06	0.05
	Dummy for water pump, 1=yes	bom_agD	0.31	0.00	0.18	0.00	0.21	0.00
Accessibility	Less than 3 Km from the airport	D_AIRP3km	0.73	0.00	0.60	0.00	0.75	0.00
	Between 3 and 5 Km from the airport	D_AIRP3to5km	0.66	0.00	0.76	0.00	0.86	0.00
	Distance from Santa Fe (business district)	Dst_SantaFe	0.94	0.00	0.92	0.00	0.93	0.00
	Distance from Zocalo (historic centre)	Dst_Zocalo	0.93	0.00	0.89	0.00	0.92	0.00
	Closest public square (Km)	PUBLICSQ	0.83	0.00	0.72	0.00	0.74	0.00
	Closest religious building (Km)	RELIGBLDG	0.81	0.00	0.58	0.00	0.72	0.00
	Closest shopping centre (Km)	SHOPCENT	0.85	0.00	0.79	0.00	0.86	0.00
	Closest green space (Km)	GREENAREA	0.75	0.00	0.72	0.00	0.82	0.00
	Closest closest medical facility (Km)	MEDICSERV	0.66	0.00	0.76	0.00	0.80	0.00
	Closest school (Km)	SCHOOL	0.75	0.00	0.78	0.00	0.79	0.00
	Closest underground station (Km)	UNDERGSTN	0.88	0.00	0.84	0.00	0.85	0.00
	Closest market (Km)	MARKET	0.69	0.00	0.70	0.00	0.76	0.00
	Closest sports and recreation facility (Km)	SPORTSREC	0.82	0.00	0.69	0.00	0.82	0.00
Location in the city	Centre dummy	city_z1	0.87	0.00	0.78	0.00	0.87	0.00
	Northeast dummy	city_z2	0.74	0.00	0.81	0.00	0.85	0.00
	Northwest dummy	city_z3	0.81	0.00	0.83	0.00	0.82	0.00
	Southeast dummy	city_z4	0.84	0.00	0.84	0.00	0.90	0.00
	Southwest dummy	city_z5	0.87	0.00	0.77	0.00	0.86	0.00

Annex 5.2 – Moran's I test for spatial dependence (cont.) – spatial dependence in the error term

- **2006**

Moran's I

Variables	I	E(I)	sd(I)	z	p-value*
resid	0.125	-0.001	0.033	3.801	0.000

*1-tail test

- **2008**

Moran's I

Variables	I	E(I)	sd(I)	z	p-value*
resid	0.055	-0.001	0.033	1.706	0.044

*1-tail test

- **2010**

Moran's I

Variables	I	E(I)	sd(I)	z	p-value*
resid	0.074	-0.001	0.033	2.304	0.011

*1-tail test

Annex 5.3 – Endogeneity and Instrumental Variable Tests

	PM10	PM25	O3
Wu-Hausman F test of endogeneity	p = 0.2434	p = 0.5534	p = 0.9466
Overidentifying restrictions test (Hansen's J)	p = 0.4927	p = 0.5689	p = 0.5196
Weak instrument test - all instruments (F-statistic)	395.316	59.7344	92.7734
Weak instrument test - best instrument = TEMP (just-identified regression, F-statistic)	210.071	169.872	102.62

Annex 5.4 – Comparison of econometric models

Figure 15 - Comparison of regressions, PM10

Ln(rent)	Spatial with IVs			Spatial no IVs			OLS with IVs			OLS no IVs		
	Coefficient	Standard Error	p-value	Coefficient	Standard Error	p-value	Coefficient	Standard Error	p-value	Coefficient	Standard Error	p-value
Property characteristics												
Neighbourhood quality												
PM 10 (μg/m³)	-0.004	0.002	0.077	-0.005	0.002	0.04	-0.003	0.003	0.180	-0.004	-2.080	0.038
Population in neighbourhood with university education (%)	1.232	0.129	0.000	1.388	0.136	0.000	1.423	0.094	0.000	1.410	15.200	0.000
Property structure												
Number of rooms (cuart)	0.133	0.025	0.000	0.134	0.025	0.000	0.135	0.009	0.00	0.135	15.100	0.000
Roof quality dummy (techosD)	0.295	0.047	0.000	0.306	0.047	0.00	0.308	0.040	0.00	0.309	7.720	0.000
Water boiler dummy (calenD)	0.175	0.035	0.000	0.177	0.035	0.000	0.171	0.034	0.000	0.171	4.960	0.000
Water tank on the roof dummy (tin_azoD)	0.108	0.030	0.000	0.108	0.030	0.000	0.111	0.031	0.00	0.110	3.490	0.000
Doesn't share toilet with another household dummy (uso_comD)	0.173	0.043	0.000	0.179	0.043	0.000	0.176	0.036	0.000	0.176	4.860	0.000
Clothes wash basin dummy (piletaD)	-0.061	0.025	0.014	-0.064	0.025	0.011	-0.062	0.025	0.013	-0.062	-2.440	0.015
Fixed gas tank dummy (tan_gasD)	0.280	0.034	0.000	0.284	0.035	0.000	0.298	0.031	0.000	0.298	9.410	0.000
Accessibility (distance in Km to...)												
Shopping centre, log (closest)	-0.057	0.020	0.004	-0.064	0.021	0.002	-0.070	0.018	0.000	-0.068	-3.840	0.000
Religious building centre, log (closest)	0.048	0.015	0.001	0.051	0.016	0.001	0.052	0.016	0.001	0.051	3.210	0.001
Medical services, log (closest)	-0.031	0.017	0.074	-0.034	0.018	0.06	-0.034	0.017	0.05	-0.034	-1.940	0.052
School, log (closest)	0.030	0.012	0.015	0.031	0.013	0.02	0.032	0.012	0.01	0.031	2.630	0.009
Market, log (closest)	0.033	0.013	0.013	0.034	0.014	0.015	0.035	0.013	0.006	0.036	2.760	0.006
Airport vicinity dummy (1=less than 3 Km)	-0.087	0.050	0.080	-0.097	0.052	0.06	-0.098	0.051	0.055	-0.095	-1.860	0.063
Location in the city (compared to city centre)												
Northwest	-0.164	0.038	0.000	-0.180	0.041	0.00	-0.195	0.034	0.000	-0.190	-5.690	0.000
Southeast	-0.111	0.038	0.003	-0.116	0.039	0.00	-0.112	0.038	0.00	-0.117	-3.070	0.002
constant	7.665	0.446	0.000	8.451	0.442	0.00	8.608	0.241	0.00	8.651	37.110	0.000
lambda												
constant	0.096	0.037	0.009	0.019	0.037	0.605						
rho												
constant	0.045	0.047	0.333	0.111	0.046	0.016						
R-squared								0.680			0.680	
n		1557			1557			1557			1557	

Figure 46 - Comparison of regressions, PM25

Ln(rent)	Spatial with IVs			Spatial no IVs			OLS with IVs			OLS no IVs		
	Coefficient	Standard Error	p-value	Coefficient	Standard Error	p-value	Coefficient	Standard Error	p-value	Coefficient	Standard Error	p-value
Property characteristics												
Neighbourhood quality												
PM 25 (μg/m³)	-0.021	0.006	0.001	-0.022	0.006	0.00	-0.020	0.006	0.002	-0.022	0.006	0.000
Population in neighbourhood with university education (%)	1.309	0.157	0.000	1.424	0.178	0.000	1.564	0.126	0.000	1.570	0.127	0.000
Property structure												
Number of rooms (`cuart`)	0.105	0.028	0.000	0.105	0.028	0.00	0.106	0.011	0.000	0.106	0.011	0.000
Roof quality dummy (`techosD`)	0.378	0.070	0.000	0.384	0.070	0.00	0.390	0.056	0.000	0.390	0.056	0.000
Water boiler dummy (`calenD`)	0.228	0.048	0.000	0.238	0.048	0.000	0.242	0.047	0.000	0.242	0.048	0.000
Water tank on the roof dummy (`tin_azoD`)	0.108	0.042	0.010	0.108	0.043	0.01	0.106	0.042	0.012	0.106	0.042	0.013
Doesn't share toilet with another household dummy (`uso_comD`)	0.149	0.062	0.016	0.156	0.063	0.013	0.158	0.052	0.002	0.156	0.052	0.003
Clothes wash basin dummy (`piletaD`)	-0.093	0.033	0.005	-0.095	0.033	0.004	-0.096	0.033	0.004	-0.097	0.033	0.004
Fixed gas tank dummy (`tan_gasD`)	0.264	0.042	0.00	0.264	0.042	0.000	0.274	0.040	0.000	0.273	0.040	0.000
Accessibility (distance in Km to...)												
Shopping centre, log (closest)	-0.074	0.028	0.008	-0.076	0.030	0.011	-0.080	0.029	0.006	-0.078	0.029	0.008
Religious building centre, log (closest)	0.063	0.016	0.000	0.067	0.018	0.000	0.068	0.020	0.001	0.068	0.020	0.001
School, log (closest)	0.028	0.013	0.029	0.028	0.014	0.04	0.029	0.013	0.026	0.030	0.013	0.027
Airport vicinity dummy (1=less than 3 Km)	-0.079	0.046	0.09	-0.088	0.050	0.08	-0.092	0.052	0.077	-0.095	0.053	0.070
Location in the city (compared to city centre)												
Northeast	0.120	0.043	0.005	0.119	0.046	0.010	0.111	0.051	0.029	0.112	0.052	0.030
Northwest	-0.158	0.044	0.00	-0.169	0.047	0.000	-0.184	0.041	0.000	-0.183	0.042	0.000
constant	7.807	0.55	0.00	8.285	0.584	0.00	8.855	0.287	0.000	8.908	0.286	0.000
lambda												
constant	0.119	0.048	0.013	0.067	0.052	0.193						
rho												
constant	-0.082	0.060	0.170	-0.002	0.063	0.973		0.649			0.649	
R-squared												
n		922			922			922			922	

Figure 57 - Comparison of regressions, O3

Ln(rent)	Spatial with IVs			Spatial no IVs			OLS with IVs			OLS no IVs		
	Coefficient	Standard Error	p-value	Coefficient	Standard Error	p-value	Coefficient	Standard Error	p-value	Coefficient	Standard Error	p-value
Property characteristics												
Neighbourhood quality												
O3 (ppb)	-0.013	0.010	0.182	-0.011	0.008	0.15	-0.010	0.009	0.245	-0.011	0.007	0.105
Population in neighbourhood with university education (%)	1.500	0.142	0.000	1.569	0.146	0.000	1.499	0.087	0.000	1.499	0.088	0.000
Property structure												
Number of rooms (`cuart`)	0.135	0.024	0.000	0.135	0.024	0.000	0.138	0.009	0.000	0.138	0.009	0.000
Roof quality dummy (`techosD`)	0.344	0.046	0.000	0.350	0.046	0.000	0.346	0.037	0.00	0.346	0.037	0.000
Water boiler dummy (`calenD`)	0.192	0.034	0.000	0.195	0.034	0.000	0.188	0.030	0.000	0.188	0.030	0.000
Doesn't share toilet with another household dummy (`uso_comD`)	0.221	0.039	0.000	0.226	0.039	0.000	0.209	0.033	0.000	0.209	0.034	0.000
Clothes wash basin dummy (`piletaD`)	-0.051	0.024	0.036	-0.051	0.024	0.034	-0.048	0.025	0.053	-0.048	0.025	0.053
Fixed gas tank dummy (`tan_gasD`)	0.289	0.036	0.000	0.291	0.035	0.000	0.311	0.032	0.000	0.311	0.032	0.000
Accessibility (distance in Km to...)												
Shopping centre, log (closest)	-0.065	0.023	0.004	-0.072	0.023	0.002	-0.073	0.019	0.000	-0.073	0.019	0.000
Religious building centre, log (closest)	0.038	0.017	0.028	0.040	0.018	0.03	0.036	0.016	0.020	0.036	0.016	0.020
School, log (closest)	0.041	0.012	0.000	0.042	0.012	0.00	0.040	0.010	0.00	0.040	0.010	0.000
Market, log (closest)	0.028	0.014	0.045	0.028	0.015	0.06	0.027	0.013	0.03	0.028	0.013	0.028
Location in the city (compared to city centre)												
Northeast	-0.174	0.041	0.000	-0.181	0.043	0.00	-0.179	0.034	0.000	-0.178	0.034	0.000
Northwest	-0.086	0.036	0.016	-0.087	0.037	0.020	-0.087	0.034	0.011	-0.086	0.034	0.012
Southeast	0.136	0.055	0.014	0.131	0.051	0.010	0.124	0.048	0.010	0.127	0.043	0.003
constant	8.330	0.489	0.000	8.652	0.466	0.000	8.501	0.233	0.000	8.513	0.217	0.000
lambda												
constant	0.017	0.038	0.663	0.020	0.038	0.597						
rho												
constant	0.133	0.046	0.004	0.180	0.045	0.000						
R-squared								0.694			0.694	
n		1,648			1,648			1,648			1,648	

Annex 6.1 – Principal component analysis for the social capital variables

Table 48 – Principal component analysis results for the social capital variables

Support from others when in need	k	Eigenvalues	Proportion explained	Cum. explained
	1	2.212	0.442	0.442
	2	0.825	0.165	0.607
	3	0.732	0.146	0.754
	4	0.657	0.131	0.885
	5	0.575	0.115	1.000
Trust in institutions	**k**	**Eigenvalues**	**Proportion explained**	**Cum. explained**
	1	6.163	0.474	0.474
	2	2.099	0.161	0.636
	3	1.041	0.080	0.716
	4	0.892	0.069	0.784
	5	0.643	0.049	0.834
	6	0.549	0.042	0.876
	7	0.510	0.039	0.915
	8	0.333	0.026	0.941
	9	0.260	0.020	0.961
	10	0.212	0.016	0.977
	11	0.130	0.010	0.987
	12	0.107	0.008	0.995
	13	0.061	0.005	1.000
Membership in organisations	**k**	**Eigenvalues**	**Proportion explained**	**Cum. explained**
	1	3.225	0.461	0.461
	2	0.947	0.135	0.596
	3	0.848	0.121	0.717
	4	0.671	0.096	0.813
	5	0.475	0.068	0.881
	6	0.429	0.061	0.942
	7	0.405	0.058	1.000
Socialising	**k**	**Eigenvalues**	**Proportion explained**	**Cum. explained**
	1	1.915	0.638	0.638
	2	0.658	0.219	0.857
	3	0.428	0.143	1.000

Annex 6.2 – Location dummies used in the ordered probit regression

Table 49 – Location dummies (boroughs)

	Frequency	Percent
Álvaro Obregón	115	6.12
Atizapán de Zaragoza	61	3.24
Azcapotzalco	71	3.78
Benito Juárez	169	8.99
Chalco	4	0.21
Coacalco de Berriozábal	37	1.97
Coyoacán	116	6.17
Cuajimalpa de Morelos	19	1.01
Cuauhtémoc	141	7.5
Cuautitlán	7	0.37
Cuautitlán Izcalli	48	2.55
Ecatepec de Morelos	102	5.43
Gustavo A. Madero	153	8.14
Huixquilucan	15	0.8
Iztacalco	56	2.98
Iztapalapa	141	7.5
La Magdalena Contreras	33	1.76
La Paz	7	0.37
Miguel Hidalgo	131	6.97
Milpa Alta	5	0.27
Morelos	1	0.05
Naucalpan de Juárez	102	5.43
Nezahualcóyotl	66	3.51
Nicolás Romero	1	0.05
Tecámac	29	1.54
Tláhuac	25	1.33
Tlalmanalco	1	0.05
Tlalpan	125	6.65
Valle de Chalco Solidaridad	3	0.16
Venustiano Carranza	68	3.62
Xochimilco	28	1.49
Total	1,880	100

Note: sample C; ‘Delegación’ or ‘Municipio’ name.

Annex 6.3 – Moran's I test of spatial dependence

- **SWB1 – Life satisfaction**

Moran's I

Variables	I	E(I)	sd(I)	z	p-value*
LSsatisfied	0.000	-0.001	0.006	0.264	0.396

*1-tail test

- **SWB2 - Eudamonia**

Moran's I

Variables	I	E(I)	sd(I)	z	p-value*
LSeudaimonia	-0.001	-0.001	0.006	0.021	0.492

*1-tail test

- **SWB3 – Happiness (positive affect)**

Moran's I

Variables	I	E(I)	sd(I)	z	p-value*
LSextrnlhappy	0.005	-0.001	0.006	1.064	0.144

*1-tail test

- **SWB4 –Anxiousness (negative affect)**

Moran's I

Variables	I	E(I)	sd(I)	z	p-value*
LSintrnlanxious	-0.003	-0.001	0.006	-0.312	0.377

*1-tail test

Annex 6.4 - Ordered probit regression tables

1. Full regression

2. High income group

3. Low income group

4. High social capital group

5. Low social capital group

6. Traditionalist group

7. ‘Miniaturisation of society’ group

Note: * significant at 10%; ** significant at 5%; *** significant at 1% level. For 1. only significant time and location dummies are reported. For 2. To 5. time and location dummies are not reported. Cut off points for the ordered probit regressions are not reported. Robust standard errors.

Annex 6.4.1 – Ordered probit regression tables – full regression

Table 50 – Ordered probit regression results, SWB1 – Life satisfaction

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.06	0.11	-0.08	0.12								
PM2.5 (log)					0.01	0.2	-0.09	0.2				
O3 (log)									-0.07	0.14	-0.11	0.15
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.00	0.00	0.00	0.00 *	0.0	0.00	0.0	0.00	0.00	0.00	0.00
Married (=1)	0.23 ***	0.06	0.22 ***	0.07	0.14 *	0.1			0.24 ***	0.06	0.22 ***	0.07
University education (=1)												
Unemployed (=1)	-0.66 ***	0.15	-0.86 ***	0.17	-0.34 *	0.2	-0.53 **	0.2	-0.65 ***	0.15	-0.85 ***	0.17
Very religious (=1)	0.12 *	0.07	0.16 *	0.09	0.16 *	0.1			0.15 **	0.07	0.18 **	0.09
Smoker (=1)			-0.12 *	0.07			-0.19 **	0.1			-0.12 *	0.07
Own insurance (=1)	0.15 **	0.07	0.17 *	0.08					0.13 *	0.07	0.18 **	0.08
No insurance (=1)	-0.14 *	0.08							-0.15 *	0.08	0.09 ***	0.03
Has children under 18 (=1)												
Heart disease (=1)	-0.38 **	0.18			-0.61 ***	0.2	-0.64 ***	0.2	-0.37 **	0.18	-0.37 **	0.19
Bronchitis (=1)					-0.39 **	0.2						
Asthma (=1)	-0.35 ***	0.13	-0.37 *	0.17					-0.35 ***	0.13	-0.37 **	0.17
High blood pressure (=1)			-0.19 **	0.09								
Cancer (=1)												
Hospital admission (=1)												
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)												
Health Ministry logo (=1)												
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completion (mins)												
Doubted product would work (=1)	-0.16 ***	0.06	-0.13 *	0.07	-0.20 **	0.1	-0.15 *	0.1	-0.17 ***	0.06	-0.14 **	0.07
Risk doesn't apply to them (=1)	0.29 ***	0.06	0.19 **	0.08	0.21 ***	0.1			0.29 ***	0.06	0.19 **	0.08
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)			0.20 ***	0.11					0.16 *	0.10	0.20 *	0.11
Thought own risk of dying was higher (=1)			0.33 **	0.18			0.62 ***	0.2			0.34 *	0.17
Thought about other benefits (=1)	-0.11 *	0.06	-0.12 *	0.07	-0.15 **	0.1			-0.12 *	0.06	-0.13 **	0.1
Thought there would be side effects (=1)												
Socialisation	0.12 ***	0.03	0.10 ***	0.03	0.14 ***	0.0	0.10 **	0.0	0.12 ***	0.03	0.09 ***	0.03
Support from others	0.10 ***	0.03	0.08 ***	0.03	0.10 ***	0.0			0.11 ***	0.03		
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)	-0.09 **	0.04	-0.09 *	0.04	-0.09 *	0.0			-0.09 **	0.04	-0.10 **	0.04
Political parties, the police, law courts, and the Federal Government (=1)	0.12 ***	0.03	0.09 ***	0.04	0.13 ***	0.0	0.10 **	0.0	0.12 ***	0.03	0.09 **	0.04
NGOs (=1)												
Government Ministries (=1)												
The Press (=1)												
Large companies (=1)												
The Church (=1)												
Generalised trust (=1)	-0.23 ***	0.06	-0.24 **	0.07	-0.28 ***	0.1	-0.31 ***	0.1	-0.24 ***	0.06	-0.25 ***	0.07
La Paz	-0.90 *	0.53	0.45 **	0.23								
Valle de Chalco Solidaridad	-0.89 ***	0.12	-0.90 ***	0.15								
Tlalpan					5.06 ***	0.27	5.59 ***	0.27				
Tláhuac					0.77 **	0.39						
Number of observations	1,521		1,386		933		855		1,557		1,428	

Table 51 – Ordered probit regression results, SWB2 – Eudaimonia

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.03	0.12	-0.11	0.13								
PM2.5 (log)					0.23	0.19	0.13	0.22				
O3 (log)									-0.10	0.14	-0.13	0.15
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.00	0.00	0.00	0.00 *	0.00	0.00 **	0.00	0.00	0.00	0.00	0.00
Married (=1)												
University education (=1)	0.21 ***	0.06	0.23 ***	0.07					0.22 ***	0.06	0.24 ***	0.07
Unemployed (=1)	-0.51 ***	0.15	-0.56 ***	0.17	-0.35 **	0.17	-0.45 *	0.23	-0.50 ***	0.15	-0.58 ***	0.17
Very religious (=1)	0.16 **	0.08					0.20 *	0.11	0.16 **	0.08	0.16 *	0.09
Smoker (=1)												
Own insurance (=1)	0.18 **	0.07	0.24 ***	0.08	0.17 *	0.09	0.25 **	0.11	0.19 ***	0.07	0.22 ***	0.08
No insurance (=1)												
Has children under 18 (=1)												
Heart disease (=1)			-0.40 **	0.20							-0.37 *	0.21
Bronchitis (=1)	-0.27 **	0.12			-0.27 *	0.16			-0.26 **	0.12		
Asthma (=1)	-0.43 ***	0.13	-0.48 ***	0.16	-0.31 *	0.17	-0.36 *	0.21	-0.42 ***	0.13	-0.46 ***	0.16
High blood pressure (=1)												
Cancer (=1)			0.42 *	0.24								
Hospital admission (=1)												
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)												
Health Ministry logo (=1)												
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)												
Doubted product would work (=1)												
Risk doesn't apply to them (=1)	0.18 ***	0.06	0.15 **	0.07	0.18 **	0.08			0.19 ***	0.06	0.13 *	0.07
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)	-0.10 *	0.06			-0.20 **	0.08	-0.23 ***	0.09			-0.11 *	0.1
Thought there would be side effects (=1)												
Socialisation	0.12 ***	0.03	0.09 ***	0.03	0.10 ***	0.04			0.11 ***	0.03	0.09 ***	0.03
Support from others	0.10 ***	0.03	0.09 ***	0.03	0.10 ***	0.04	0.11 ***	0.04	0.09 ***	0.03	0.10 ***	0.03
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)											-0.08 *	0.04
Political parties, the police, law courts, and the Federal Government (=1)	0.12 ***	0.04	0.09 **	0.04	0.16 *	0.04	0.16 ***	0.05	0.12 ***	0.04	0.11 ***	0.04
NGOs (=1)	-0.06 *	0.03										
Government Ministries (=1)												
The Press (=1)												
Large companies (=1)	0.13 **	0.06	0.13 *	0.07							0.13 *	0.07
The Church (=1)	0.11 *	0.06										
Generalised trust (=1)	-0.20 ***	0.06	-0.20 ***	0.07	-0.25 **	0.08	-0.26 ***	0.09	-0.20 ***	0.06	-0.21 ***	0.07
Distance to historic centre (Km)					0.00 **	0.00	0.00 **	0.00				
Monday (=1)									0.11 *	0.06		
Wednesday (=1)	-0.12 *	0.07							-0.13 *	0.07		
1st week of the month (=1)	-0.68 **	0.30	-0.55 *	0.3	-0.61 ***	0.35			-0.66 **	0.30		
October (=1)	0.61 **	0.29	0.59 **	0.3	0.61 *	0.33			0.59 **	0.29		
Nezahualcóyotl	0.33 **	0.16	0.33 *	0.17								
Valle de Chalco Solidaridad	-1.15 ***	0.13	-1.00 ***	0.11					-1.26 ***	0.12	-1.17 ***	0.14
Tlalpan					4.37 ***	0.28	4.81 ***	0.26				
Tláhuac	0.52 **	0.23	0.49 *	0.27							0.48 *	0.26
Xochimilco	0.80 **	0.33	0.77 **	0.33					0.80 **	0.32	0.73 **	0.37
La Magdalena Contreras									-0.32 *	0.20		
Number of observations	1,521		1,386		933		855		1,557		1,428	

Table 52 – Ordered probit regression results, SWB3 – Happiness (positive affect)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	0.02	0.12	-0.09	0.13								
PM2.5 (log)					0.06	0.16	0.06	0.20				
O3 (log)									-0.24 *	0.15	-0.26 *	0.16
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Married (=1)	0.18 ***	0.06	0.17 ***	0.07					0.18 ***	0.06	0.18 ***	0.06
University education (=1)												
Unemployed (=1)	-0.62 ***	0.13	-0.72 ***	0.16	-0.31 *	0.16	-0.40 *	0.22	-0.61 ***	0.14	-0.74 ***	0.16
Very religious (=1)												
Smoker (=1)												
Own insurance (=1)												
No insurance (=1)												
Has children under 18 (=1)					0.12 *	0.07						
Heart disease (=1)												
Bronchitis (=1)												
Asthma (=1)	-0.33 **	0.16	-0.48 **	0.19					-0.35 **	0.15	-0.49 **	0.19
High blood pressure (=1)	-0.15 *	0.09	-0.17 *	0.10								
Cancer (=1)			0.48 **	0.22							0.39 *	0.20
Hospital admission (=1)												
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)			-0.17 *	0.09	-0.18 *	0.10	-0.24 **	0.11				
Health Ministry logo (=1)			-0.18 *	0.10								
Red Bank logo (=1)												
Spanish Bank logo (=1)			-0.21 **	0.11								
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)												
Doubted product would work (=1)					-0.15 *	0.08	-0.16 *	0.09	-0.10 *	0.06		
Risk doesn't apply to them (=1)	0.25 ***	0.06	0.17 **	0.07	0.26 ***	0.08	0.16 *	0.09	0.27 ***	0.06	0.20 ***	0.07
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)	-0.12 **	0.06	-0.12 *	0.07	-0.16 **	0.07	-0.15 *	0.08	-0.12 **	0.06	-0.12 *	0.1
Thought there would be side effects (=1)												
Socialisation	0.13 ***	0.03	0.13 ***	0.03	0.11 ***	0.04	0.10 **	0.04	0.12 ***	0.03	0.11 ***	0.03
Support from others	0.08 ***	0.03	0.06 **	0.03	0.11 ***	0.03	0.08 **	0.04	0.09 ***	0.03	0.08 ***	0.03
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)	0.11 ***	0.04	0.09 **	0.04	0.09 **	0.04	0.08 *	0.05	0.10 ***	0.04	0.08 **	0.04
NGOs (=1)	-0.07 **	0.03	-0.09 ***	0.03			-0.08 *	0.04	-0.07 **	0.03	**-0.09** ***	0.03
Government Ministries (=1)												
The Press (=1)												
Large companies (=1)												
The Church (=1)												
Generalised trust (=1)	-0.29 ***	0.06	-0.34 ***	0.07	-0.32 ***	0.07	-0.36 ***	0.09	-0.28 ***	0.06	-0.32 ***	0.07
Distance to historic centre (Km)	0.00 **	0.00							0.00 *	0.00		
Monday (=1)							-0.81 **	0.31				
Tuesday (=1)	-0.19 **	0.08	-0.19 **	0.1			-0.77 ***	0.29	-0.15 *	0.08		
Wednesday (=1)	-0.19 **	0.08	-0.15 *	0.1			-0.79 ***	0.30	-0.18 **	0.07		
Thursday (=1)							-0.72 **	0.31				
Friday (=1)	-0.29 **	0.12					-0.83 **	0.34	-0.24 *	0.13		
1st week of the month (=1)	-0.28 ***	0.10	-0.26 **	0.1					-0.23 **	0.10		
3rd week of the month (=1)					0.21 ***	0.08	0.21 **	0.11				
4th week of the month (=1)	-0.18 **	0.08	-0.19 **	0.1					-0.24 ***	0.08	-0.33 ***	0.07
La Paz												
Valle de Chalco Solidaridad	-1.78 ***	0.14	-1.48 ***	0.16					-1.78 ***	0.14	-1.58 ***	0.13
Atizapán de Zaragoza									-0.28 *	0.16		
Cuautitlán	-1.10 **	0.42	-0.85 **	0.43					-1.06 **	0.42	-0.91 *	0.48
Cuautitlán Izcalli	-0.39 **	0.19							-0.37 *	0.19	-0.36 **	0.18
Atizapán de Zaragoza	-0.27 *	0.16										
Tlalpan	-0.20 *	0.11			4.94 ***	0.27	5.24 ***	0.28	-0.21 *	0.11		
Tláhuac			0.46 **	0.18	0.80 ***	0.28	0.86 ***	0.33	0.33 **	0.17	0.47 ***	0.18
Number of observations	1,521		1,386		933		855		1,557		1,428	

Table 53 –Ordered probit regression results, SWB4 – Anxiety (negative affect) – reverse order scale (low values better)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.09	0.11	-0.12	0.13								
PM2.5 (log)					0.3	0.2	0.09	0.17				
O3 (log)									-0.04	0.14	0.08	0.15
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 *	0.00	0.00	0.00
Married (=1)												
University education (=1)												
Unemployed (=1)												
Very religious (=1)	-0.28 ***	0.07	-0.15 *	0.09	-0.32 ***	0.09	-0.23 **	0.11	-0.31 ***	0.07	-0.19 **	0.09
Smoker (=1)												
Own insurance (=1)												
No insurance (=1)												
Has children under 18 (=1)												
Heart disease (=1)												
Bronchitis (=1)	0.28 **	0.13							0.29 **	0.13	0.29 *	0.17
Asthma (=1)	0.53 ***	0.14	0.42 ***	0.16	0.44 **	0.18			0.56 ***	0.14	0.39 **	0.16
High blood pressure (=1)	0.14 *	0.08	0.19 **	0.09	0.23 **	0.11	0.30 **	0.12			0.16 *	0.09
Cancer (=1)												
Hospital admission (=1)												
Emergencies admission (=1)							0.36 **	0.16				

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)												
Health Ministry logo (=1)												
Red Bank logo (=1)												
Spanish Bank logo (=1)	0.15 *	0.09	0.21 **	0.10							0.19 **	0.09
Time on WTP5, over 25 secs (=1)	-0.18 ***	0.07	-0.16 **	0.08					-0.19 ***	0.06	-0.17 **	0.08
Time to completion (mins)	0.00 *	0.00							0.00 *	0.00		
Doubted product would work (=1)	0.21 ***	0.06	0.26 ***	0.07	0.29 ***	0.08	0.34 ***	0.09	0.20 ***	0.06	0.23 ***	0.06
Risk doesn't apply to them (=1)												
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)												
Thought there would be side effects (=1)												
Socialisation												
Support from others	-0.06 **	0.03	-0.06 **	0.03	-0.09 ***	0.03	-0.09 **	0.04	-0.07 ***	0.02	-0.07 **	0.03
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)												
Government Ministries (=1)			0.06 *	0.03								
The Press (=1)												
Large companies (=1)			-0.14 **	0.07								
The Church (=1)			0.15 **	0.07							0.15 **	0.06
Generalised trust (=1)	0.21 ***	0.06	0.18 ***	0.07	0.22 ***	0.07	0.23 ***	0.07	0.19 ***	0.06	0.15 **	0.07
Monday (=1)	-0.21 ***	0.08	-0.28 ***	0.1	-0.24 **	0.10			-0.21 ***	0.08	-0.34 ***	0.09
3rd week of the month (=1)	-0.17 ***	0.06	-0.13 *	0.1					-0.16 ***	0.06		
La Paz	0.88 **	0.42	1.19 ***	0.15					0.94 **	0.38		
Valle de Chalco Solidaridad	1.35 ***	0.13							1.49 ***	0.11	1.16 ***	0.14
Venustiano Carranza			1.26 ***	0.14							-0.26 *	0.16
Chalco	1.25 ***	0.20	-0.25 *	0.13					1.21 ***	0.22	1.30 ***	0.20
Ecatepec de Morelos			-0.68 *	0.37							-0.22 *	0.13
Cuajimalpa de Morelos	-0.65 *	0.36	-0.46 **	0.21							-0.59 *	0.31
Cuautitlán	-0.41 ***	0.14							-0.43 ***	0.14	-0.50 ***	0.19
Tláhuac					-7.43 ***	0.18	-7.49 ***	0.20				
Number of observations	1,521		1,386		933		855		1,557		1,428	

Annex 6.4.2– Ordered probit regression tables – High income

Table 54 – Ordered probit regression results, SWB1 – Life satisfaction

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	0.34	0.29	0.42 *	0.24								
PM2.5 (log)					0.2	0.3	0.54	0.43				
O3 (log)									0.30	0.34	0.32	0.38
Age (years)					-0.05 *	0.03						
Female (=1)	0.23 *	0.14					0.39 ***	0.19	0.23 *	0.14		
Household income (1000 MXN)	0.00 ***	0.00	0.00 **	0.00	0.00 **	0.00	0.00 **	0.00	0.00 **	0.00	0.00 *	0.00
Married (=1)												
University education (=1)	0.30	0.18	0.37 *	0.20	0.49 **	0.22	0.99 **	0.25			0.43 **	0.21
Unemployed (=1)	-1.00 ***	0.32	-1.11 ***	0.40	-1.16 ***	0.41	-1.39 **	0.52	-1.17 ***	0.35	-1.06 ***	0.40
Very religious (=1)												
Smoker (=1)												
Own insurance (=1)					0.33 **	0.17	1.21 **	0.43				
No insurance (=1)												
Has children under 18 (=1)												
Heart disease (=1)			1.02 **	0.45			1.50 **	0.64	0.93 *	0.51	1.21 ***	0.47
Bronchitis (=1)												
Asthma (=1)												
High blood pressure (=1)												
Hospital admission (=1)												
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample C		Sample C*		Sample C		Sample C*		Sample C		Sample C*	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)			0.42 **	0.21					0.40 **	0.18	0.43 **	0.20
Environment Ministry logo (=1)												
Health Ministry logo (=1)												
Red Bank logo (=1)					-0.51 **	0.26						
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completion (mins)					0.00 ***	0.00						
Doubted product would work (=1)												
Risk doesn't apply to them (=1)												
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)												
Thought there would be side effects (=1)	-0.42 ***	0.15	-0.38 **	0.17					-0.41 ***	0.15	-0.45 ***	0.2
Socialisation	0.29 ***	0.08	0.21 **	0.09					0.27 ***	0.08	0.23 **	0.09
Support from others	0.18 ***	0.07	0.18 **	0.08	0.24 ***	0.08	0.18 ***	0.09	0.21 ***	0.07	0.22 ***	0.08
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)	-0.19 *	0.11										
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)											**-0.15** *	0.09
Government Ministries (=1)												
The Press (=1)												
Large companies (=1)									-0.24 *	0.14		
The Church (=1)	0.31 **	0.13			0.26 *	0.15			0.26 **	0.13		
Generalised trust (=1)												
Distance to historic centre (Km)							0.00 **	0.00				
Distance to business centre (Km)			0.00 *	0.00			0.00 **	0.00	0.00 *	0.00	0.00 *	0.00
Number of observations	279		211		176		143		273		218	

Table 55 – Ordered probit regression results, SWB2 – Eudaimonia

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.12	0.3	-0.23	0.30								
PM2.5 (log)					-0.2	0.3	-0.09	0.41				
O3 (log)									-0.25	0.32	-0.14	0.36
Age (years)												
Female (=1)							0.39 *	0.20				
Household income (1000 MXN)	0.00 *	0.0	0.00 *	0.00	0.00 *	0.00	0.00	0.00	0.00 **	0.00	0.00 **	0.00
Married (=1)												
University education (=1)												
Unemployed (=1)	-0.79 *	0.4			-1.04 **	0.50	-1.24 *	0.71	-0.69 *	0.41		
Very religious (=1)												
Smoker (=1)												
Own insurance (=1)	0.33 **	0.1	0.41 ***	0.15	0.47 ***	0.17	0.77 ***	0.22	0.24 *	0.14	0.34 **	0.16
No insurance (=1)							0.72 **	0.29				
Has children under 18 (=1)												
Heart disease (=1)												
Bronchitis (=1)												
Asthma (=1)	-0.51 **	0.2			-0.65 *	0.37			-0.50 **	0.23		
High blood pressure (=1)												
Hospital admission (=1)					-1.00 ***	0.32	-2.88 ***	0.71				
Emergencies admission (=1)							1.56 **	0.62				

	PM10				PM2.5				O3			
	Sample C		Sample C*		Sample C		Sample C*		Sample C		Sample C*	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)									0.40 **	0.18		
Health Ministry logo (=1)												
Red Bank logo (=1)	-0.35 *	0.2							-0.38 *	0.21		
Spanish Bank logo (=1)							0.75 *	0.42				
Time on WTP5, over 25 secs (=1)												
Time to completion (mins)							-0.03 **	0.01				
Doubted product would work (=1)												
Risk doesn't apply to them (=1)	-0.25 *	0.1	-0.42 ***	0.15			-0.54 **	0.22			-0.38 **	0.16
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)	-0.85 **	0.3					0.86 *	0.49	-0.76 **	0.33		
Thought about other benefits (=1)												
Thought there would be side effects (=1)												
Socialisation	0.29 ***	0.1	0.23 ***	0.08	0.37 **	0.17			0.27 ***	0.08	0.25 ***	0.09
Support from others	0.12 *	0.1	0.18 **	0.09	0.16 *	0.09	0.31 ***	0.11	0.13 *	0.07	0.19 **	0.08
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)												
Government Ministries (=1)												
The Press (=1)					-0.39 *	0.20						
Large companies (=1)												
The Church (=1)	0.27 *	0.1					0.32 *	0.19				
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)									0.00 **	0.00	0.00 ***	0.00
Number of observations	279		211		176		143		273		218	

Table 56 – Ordered probit regression results, SWB3 – Happiness (positive affect)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.29	0.27	-0.28	0.28								
PM2.5 (log)					0.76 **	0.32	0.24	0.42				
O3 (log)									-0.60	0.38	-0.79 **	0.38
Age (years)			-0.04 *	0.02	-0.05 *	0.03	-0.07 **	0.03	-0.04 *	0.02	-0.05 **	0.02
Female (=1)												
Household income (1000 MXN)	0.00 *	0.00	0.00	0.00	0.00	0.00	0.00 *	0.00	0.00	0.00	0.00	0.00
Married (=1)												
University education (=1)												
Unemployed (=1)	-1.36 ***	0.31	-1.33 ***	0.29	-1.09 ***	0.30	-1.21 ***	0.32	-1.25 ***	0.29	-1.33 ***	0.31
Very religious (=1)												
Smoker (=1)												
Own insurance (=1)												
No insurance (=1)												
Has children under 18 (=1)												
Heart disease (=1)												
Bronchitis (=1)											1.09 **	0.46
Asthma (=1)												
High blood pressure (=1)												
Hospital admission (=1)												
Emergencies admission (=1)							-0.98 ***	0.38			-0.61 *	0.32

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)												
Health Ministry logo (=1)												
Red Bank logo (=1)											-0.51 **	0.24
Spanish Bank logo (=1)					0.58 **	0.24	0.57 **	0.23	0.33 **	0.16		
Time on WTP5, over 25 secs (=1)												
Time to completion (mins)												
Doubted product would work (=1)					-0.36 **	0.18						
Risk doesn't apply to them (=1)												
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)	-0.30 **	0.14	-0.29 **	0.14					-0.28 **	0.14		
Thought there would be side effects (=1)			-0.32 *	0.16								
Socialisation	0.37 ***	0.08	0.41 ***	0.08	0.27 ***	0.10			0.34 ***	0.07	0.33 ***	0.08
Support from others					0.28 ***	0.09	0.37 ***	0.09	0.13 *	0.07	0.17 **	0.07
Civic engagement	-0.15 **	0.06	-0.16 **	0.07	-0.15 *	0.08			-0.16 ***	0.06	-0.17 ***	0.06
Volunteering (=1)												
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)												
Government Ministries (=1)							0.21 **	0.10				
The Press (=1)					-0.39 **	0.20	-0.52 **	0.21				
Large companies (=1)												
The Church (=1)	0.36 **	0.14	0.39 ***	0.15	0.56 ***	0.16	0.57 ***	0.16	0.31 **	0.13	0.31 **	0.14
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)							0.00 **	0.00			0.00 *	0.00
Number of observations	279		211		176		143		273		218	

Table 57 –Ordered probit regression results, SWB4 – Anxiety (negative affect) – reverse order scale (low values better)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	0.23	0.25	0.17	0.29								
PM2.5 (log)					-0.2	0.4	-0.07	0.43				
O3 (log)									-0.53	0.37	-0.19	0.39
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.00	0.00	0.00	0.00	0.00	0.00 *	0.00	0.00	0.00	0.00	0.00
Married (=1)					0.31 *	0.16	0.36 **	0.18				
University education (=1)			-0.31 **	0.15							-0.32 **	0.16
Unemployed (=1)			0.65 **	0.31					0.54 *	0.32	0.62 **	0.30
Very religious (=1)							-0.42 **	0.21				
Smoker (=1)												
Own insurance (=1)												
No insurance (=1)												
Has children under 18 (=1)												
Heart disease (=1)					2.72 ***	0.62	3.05 ***	0.71				
Bronchitis (=1)			1.46 **	0.67							1.42 **	0.67
Asthma (=1)			0.59 *	0.34							0.57 *	0.33
High blood pressure (=1)												
Cancer (=1)												
Hospital admission (=1)												
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)												
Health Ministry logo (=1)												
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completion (mins)												
Doubted product would work (=1)	0.36 ***	0.13	0.42 ***	0.14	0.39 **	0.19	0.50 ***	0.18	0.35 ***	0.13	0.43 ***	0.14
Risk doesn't apply to them (=1)												
Didn't understand payment timing (=1)					-0.65 **	0.27	-0.57 **	0.26				
Didn't think about ability to pay (=1)	-0.36 **	0.16	-0.45 **	0.18	-0.46 **	0.23			-0.31 *	0.17	-0.43 **	0.17
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)												
Thought there would be side effects (=1)												
Socialisation					0.32 ***	0.09	0.27 ***	0.09	0.12 *	0.07		
Support from others	-0.14 **	0.07	-0.14 **	0.07	-0.19 **	0.09	-0.16 *	0.09	-0.18 ***	0.20	-0.16 **	0.07
Civic engagement					-0.14 *	0.08			-0.13 **	0.06		
Volunteering (=1)												
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)												
Government Ministries (=1)												
The Press (=1)			-0.43 **	0.18	-0.72 ***	0.19	-0.66 ***	0.19			-0.36 **	0.17
Large companies (=1)												
The Church (=1)							-0.40 **	0.19				
Generalised trust (=1)												
Distance to historic centre (Km)			0.00 ***	0.00	0.00 ***	0.00	0.00 ***	0.00			0.00 ***	0.00
Distance to business centre (Km)			0.00 ***	0.00	0.00 ***	0.00	0.00 ***	0.00			0.00 ***	0.00
Number of observations	279		211		176		143		273		218	

Annex 6.4.3 – Ordered probit regression tables – Low income

Table 58 – Ordered probit regression results, SWB1 – Life satisfaction

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.06	0.2	0.11	0.22								
PM2.5 (log)					-0.5	0.4	-0.24	0.36				
O3 (log)									0.15	0.31	0.02	0.29
Age (years)	-0.03 *	0.0	0.50 ***	0.19	-0.05 *	0.03	-0.80 **	0.32	-0.04 **	0.02	-0.03 *	0.02
Female (=1)												
Household income (1000 MXN)	-0.03 ***	0.0	-0.03 ***	0.01	-0.02	0.01	-0.02 *	0.01	-0.03 ***	0.01	-0.03 ***	0.01
Married (=1)	0.44 ***	0.1	0.33 **	0.13	0.35 **	0.16	0.33 **	0.16	0.41 ***	0.12	0.32 **	0.13
University education (=1)					-0.34 **	0.15	-0.39 **	0.16				
Unemployed (=1)	-1.10 ***	0.2	-0.90 ***	0.25					-1.07 ***	0.21	-0.89 ***	0.24
Very religious (=1)	0.57 ***	0.2	0.65 ***	0.18	0.47 **	0.23	0.51 **	0.24	0.54 ***	0.18	0.67 ***	0.18
Smoker (=1)												
Own insurance (=1)												
No insurance (=1)					-0.44 **	0.17	-0.44 **	0.18				
Has children under 18 (=1)												
Heart disease (=1)												
Bronchitis (=1)												
Asthma (=1)												
Cancer (=1)					0.49 **	0.24	0.48 *	0.25				
High blood pressure (=1)												
Hospital admission (=1)												
Emergencies admission (=1)					0.66 **	0.28						

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)												
Health Ministry logo (=1)	0.45 **	0.2							0.40 **	0.18	0.48 **	0.19
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)												
Doubted product would work (=1)												
Risk doesn't apply to them (=1)	0.60 ***	0.1	0.69 ***	0.14	0.67 ***	0.16	0.74 ***	0.18	0.60 ***	0.13	0.66 ***	0.14
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)	0.38 **	0.2	0.53 ***	0.19	0.46 **	0.21	0.66 ***	0.23	0.43 **	0.18	0.67 ***	0.20
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)	-0.24 *	0.1							-0.26 *	0.13		
Thought there would be side effects (=1)	-0.23 *	0.1			-0.45 **	0.18	-0.37 **	0.18	-0.26 *	0.14		
Socialisation	0.25 ***	0.1	0.21 ***	0.07	0.28 ***	0.09	0.27 ***	0.10	0.25 ***	0.07	0.19 ***	0.07
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)												
Government Ministries (=1)												
The Press (=1)												
Large companies (=1)	0.25 **	0.1			0.47 ***	0.16	0.46 ***	0.17	0.27 **	0.13		
The Church (=1)												
Generalised trust (=1)	-0.55 ***	0.13	-0.63 ***	0.14					-0.56 ***	0.13	-0.61 ***	0.14
Distance to historic centre (Km)												
Distance to business centre (Km)												
Number of observations	339		302		207		186		345		306	

Table 59 – Ordered probit regression results, SWB2 – Eudaimonia

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	0.65 **	0.3	0.08	0.24								
PM2.5 (log)					0.0	0.4	0.53	0.40				
O3 (log)									0.01	0.29	-0.22	0.29
Age (years)												
Female (=1)												
Household income (1000 MXN)	-0.03 ***	0.0	-0.03 ***	0.01	-0.01	0.01	-0.02	0.01	-0.03 ***	0.01	-0.03 ***	0.01
Married (=1)					0.26 *	0.15						
University education (=1)	-0.23 *	0.1	-0.28 **	0.13			-0.38 **	0.17			-0.26 **	0.13
Unemployed (=1)	-1.05 ***	0.2	-0.85 ***	0.23			-0.51 *	0.28	-0.99 ***	0.22	-0.88 ***	0.23
Very religious (=1)	0.47 ***	0.2	0.54 ***	0.19	0.55 **	0.25	0.67 **	0.26	0.52 ***	0.18	0.57 ***	0.19
Smoker (=1)							-0.34 *	0.18				
Own insurance (=1)												
No insurance (=1)					-0.34 *	0.18						
Has children under 18 (=1)												
Heart disease (=1)												
Bronchitis (=1)												
Asthma (=1)												
Cancer (=1)					0.80 ***	0.30	0.79 **	0.38				
High blood pressure (=1)					0.52 **	0.23	0.59 **	0.24				
Hospital admission (=1)												
Emergencies admission (=1)					0.56 *	0.30						

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)					-0.42 **	0.19						
Foreign university logo (=1)												
Environment Ministry logo (=1)					-0.40 *	0.24						
Health Ministry logo (=1)												
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)									0.28 *	0.14		
Time to completition (mins)												
Doubted product would work (=1)												
Risk doesn't apply to them (=1)	0.48 ***	0.1	0.56 ***	0.14	0.58 ***	0.18	0.53 ***	0.20	0.50 ***	0.13	0.56 ***	0.14
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)					0.37 *	0.20	0.40 *	0.24				
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)	-0.32 **	0.1			-0.45 ***	0.17			-0.37 ***	0.13		
Thought there would be side effects (=1)					-0.34 *	0.18	-0.53 ***	0.20				
Socialisation	0.19 ***	0.1	0.15 **	0.07	0.30 ***	0.09	0.24 **	0.10	0.19 ***	0.07	0.14 **	0.07
Support from others			0.12 **	0.05							0.12 **	0.05
Civic engagement	0.13 **	0.1	0.18 ***	0.05					0.12 **	0.05		
Volunteering (=1)												
Trust in institutions												
Universities (=1)	0.14 **	0.1										
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)												
Government Ministries (=1)												
The Press (=1)							0.31 *	0.19				
Large companies (=1)					0.60 ***	0.17	0.48 ***	0.18				
The Church (=1)							0.38 **	0.17				
Generalised trust (=1)	-0.43 ***	0.13	-0.38 ***	0.15					-0.45 ***	0.13	-0.39 ***	0.14
Distance to historic centre (Km)												
Distance to business centre (Km)												
Number of observations	339		302		207		186		345		306	

Table 60 – Ordered probit regression results, SWB3 – Happiness (positive affect)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	0.70 **	0.3	0.56 **	0.24								
PM2.5 (log)					0.0	0.4	0.63 *	0.35				
O3 (log)									-0.02	0.29	0.08	0.29
Age (years)												
Female (=1)					-0.46 ***	0.17	-0.47 ***	0.18				
Household income (1000 MXN)	-0.02 **	0.0	-0.03 ***	0.01	-0.02 *	0.01	-0.02	0.01	-0.03 ***	0.01	-0.03 **	0.01
Married (=1)	0.45 ***	0.1	0.34 ***	0.13	0.33 **	0.16			0.43 ***	0.12	0.42 ***	0.13
University education (=1)												
Unemployed (=1)	-0.95 ***	0.2	-0.72 ***	0.22	-0.55 **	0.27	-0.64 **	0.27	-0.86 ***	0.19	-0.76 ***	0.21
Very religious (=1)												
Smoker (=1)							-0.32 *	0.18				
Own insurance (=1)									-0.29 *			
No insurance (=1)					-0.34 *	0.18						
Has children under 18 (=1)												
Heart disease (=1)												
Bronchitis (=1)												
Asthma (=1)			-0.69 *	0.39								
High blood pressure (=1)	-0.37 **	0.2								0.17	-0.38 *	0.20
Hospital admission (=1)												
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)					-0.44 *	0.27						
Health Ministry logo (=1)												
Blue Bank logo (=1)	0.39 *	0.2					0.49 **	0.23	0.32 *	0.18	0.41 *	0.22
Red Bank logo (=1)					-0.64 **	0.25						
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completion (mins)												
Doubted product would work (=1)												
Risk doesn't apply to them (=1)	0.46 ***	0.1	0.55 ***	0.14	0.62 ***	0.18	0.56 ***	0.19	0.52 ***	0.13	0.56 ***	0.14
Didn't understand payment timing (=1)			-0.34 **	0.17	-0.48 **	0.22			-0.36 **	0.15	-0.29 *	0.16
Didn't think about ability to pay (=1)			0.51 ***	0.19	0.63 ***	0.21	0.54 **	0.21	0.33 *	0.17	0.60 ***	0.19
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)	-0.31 **	0.1	-0.28 **	0.14	-0.44 **	0.18	-0.35 *	0.18	-0.34 ***	0.13	-0.29 **	0.14
Thought there would be side effects (=1)												
Socialisation	0.24 ***	0.1	0.16 **	0.07	0.17 *	0.09	0.18 *	0.09	0.19 ***	0.07	0.23 ***	0.07
Support from others												
Civic engagement			0.09 *	0.06					0.09 *	0.06		
Volunteering (=1)												
Trust in institutions												
Universities (=1)	0.19 ***	0.1	0.14 *	0.08					0.17 ***	0.07	0.15 **	0.07
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)												
Government Ministries (=1)												
The Press (=1)												
Large companies (=1)					0.52 ***	0.18	0.42 **	0.19				
The Church (=1)	-0.21 *	0.1			-0.31 **	0.15			-0.24 *	0.12		
Generalised trust (=1)	-0.47 ***	0.14	-0.58 ***	0.14	-0.43 **	0.18	-0.37 **	0.18	-0.49 ***	0.14	-0.54 ***	0.14
Distance to historic centre (Km)												
Distance to business centre (Km)												
Number of observations	339		302		207		186		345		306	

Table 61 –Ordered probit regression results, SWB4 – Anxiety (negative affect) – reverse order scale (low values better)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.21	0.2	-0.18	0.24								
PM2.5 (log)					0.1	0.3	0.06	0.34				
O3 (log)									0.18	0.25	-0.16	0.28
Age (years)							0.06 *	0.03				
Female (=1)												
Household income (1000 MXN)	0.01	0.0	0.01	0.01	0.02 **	0.01	0.02 **	0.01	0.01	0.01	0.01	0.01
Married (=1)												
University education (=1)												
Unemployed (=1)												
Very religious (=1)	-0.47 ***	0.2	-0.38 **	0.17	-0.45 **	0.20	-0.41 **	0.20	-0.43 ***	0.16	-0.38 **	0.17
Smoker (=1)												
Own insurance (=1)												
No insurance (=1)												
Has children under 18 (=1)												
Heart disease (=1)	-0.46 *	0.2			-0.66 **	0.33			-0.45 *	0.24		
Bronchitis (=1)												
Asthma (=1)												
High blood pressure (=1)												
Hospital admission (=1)												
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)												
Health Ministry logo (=1)												
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)												
Doubted product would work (=1)												
Risk doesn't apply to them (=1)												
Didn't understand payment timing (=1)	-0.29 *	0.2	-0.34 *	0.19					-0.36 **	0.18	-0.40 **	0.18
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)												
Thought there would be side effects (=1)	0.29 **	0.1	0.30 **	0.14	0.34 **	0.17	0.42 **	0.18	0.28 **	0.13	0.31 **	0.14
Socialisation												
Support from others												
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)	-0.15 **	0.1			-0.17 **	0.08			-0.14 **	0.06		
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)												
Government Ministries (=1)	0.13 **	0.1										
The Press (=1)												
Large companies (=1)												
The Church (=1)									0.25 **	0.12		
Generalised trust (=1)	0.33 ***	0.12	0.39 ***	0.13	0.27 *	0.15	0.34 **	0.16	0.31 **	0.12	0.38 ***	0.13
Distance to historic centre (Km)												
Distance to business centre (Km)												
Number of observations	339		302		207		186		345		306	

Annex 6.4.4 – Ordered probit regression tables – High social capital

Table 62 – Ordered probit regression results, SWB1 – Life satisfaction

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.11	0.2	-0.09	0.21								
PM2.5 (log)					0.1	0.3	0.36	0.37				
O3 (log)									-0.14	0.24	-0.37	0.27
Age (years)	-0.04 **	0.0	-0.04 **	0.02	-0.04 *	0.02	0.16 **	0.08	-0.03 **	0.02	-0.04 **	0.02
Female (=1)												
Household income (1000 MXN)	0.00	0.0	0.00	0.00	0.00 **	0.00	0.00 **	0.00	0.00	0.00	0.00	0.00
Married (=1)												
University education (=1)												
Unemployed (=1)	-0.78 ***	0.3	-0.74 **	0.30					-0.74 **	0.28	-0.67 **	0.29
Very religious (=1)												
Smoker (=1)												
Own insurance (=1)												
No insurance (=1)					-0.43 **	0.19 :e	**	0.20			-0.23 *	0.14
Has children under 18 (=1)												
Heart disease (=1)												
Bronchitis (=1)					-0.63 ***	0.19	-0.74 ***	0.20				
Asthma (=1)					0.46 *	0.25						
Cancer (=1)												
High blood pressure (=1)	-0.38 ***	0.1	-0.40 ***	0.15			-0.35 *	0.21	-0.36 ***	0.13	-0.41 ***	0.15
Hospital admission (=1)	0.32 *	0.2			0.48 **	0.21	0.39 *	0.23	0.38 **	0.17		
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)	0.31 **	0.1			0.31 *	0.18			0.23 *	0.14		
Environment Ministry logo (=1)												
Health Ministry logo (=1)												
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)					0.00 **	0.00	0.00 **	0.00				
Doubted product would work (=1)	-0.20 *	0.1	-0.23 **	0.11	-0.27 *	0.14	-0.31 **	0.14	-0.18 *	0.11	-0.20 *	0.11
Risk doesn't apply to them (=1)	0.30 ***	0.1	0.29 **	0.12					0.30 ***	0.11	0.31 ***	0.12
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)												
Thought there would be side effects (=1)												
Socialisation	0.15 ***	0.1	0.17 ***	0.06	0.18 **	0.07			0.12 **	0.05	0.16 ***	0.06
Support from others									0.09 *	0.05		
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)	0.14 **	0.1			0.19 **	0.09	0.18 **	0.08				
NGOs (=1)									-0.12 **	0.05	-0.10 *	0.05
Government Ministries (=1)									0.13 **	0.05	0.12 **	0.06
The Press (=1)												
Large companies (=1)			0.21 **	0.11					0.18 *	0.10	0.19 *	0.10
The Church (=1)												
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)	0.00 ***	0.00	0.00 ***	0.00	0.00 ***	0.00	0.00 ***	0.00	0.00 **	0.00	0.00 *	0.00
Number of observations	468		439		272		256		481		451	

Table 63 – Ordered probit regression results, SWB2 – Eudaimonia

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	0.03	0.2	-0.10	0.22								
PM2.5 (log)					0.1	0.4	-0.33	0.41				
O3 (log)									-0.32	0.26	-0.70 ***	0.27
Age (years)			-0.04 **	0.02			-0.04 *	0.02	-0.03 *	0.02	-0.04 **	0.02
Female (=1)												
Household income (1000 MXN)	0.00	0.0	0.00	0.00	0.00 ***	0.00	0.00 **	0.00	0.00	0.00	0.00	0.00
Married (=1)												
University education (=1)											-0.19 *	0.11
Unemployed (=1)	-0.79 ***	0.3	-0.73 **	0.29					-0.70 **	0.28	-0.61 **	0.30
Very religious (=1)												
Smoker (=1)												
Own insurance (=1)	0.23 *	0.1	0.24 **	0.12							0.26 **	0.11
No insurance (=1)												
Has children under 18 (=1)												
Heart disease (=1)			-0.34 **	0.16								
Bronchitis (=1)									-0.31 *	0.19	-0.43 **	0.18
Asthma (=1)											-0.43 *	0.24
Cancer (=1)												
High blood pressure (=1)												
Hospital admission (=1)												
Emergencies admission (=1)									-0.49 ***	0.18		

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)	0.23 *	0.1										
Health Ministry logo (=1)												
Red Bank logo (=1)	-0.43 ***	0.2	-0.43 **	0.17			-0.48 *	0.25	-0.38 **	0.16	-0.40 **	0.16
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)							0.00 *	0.00				
Doubted product would work (=1)												
Risk doesn't apply to them (=1)	-0.34 *	0.2	-0.47 ***	0.18								
Didn't understand payment timing (=1)					0.47 *	0.28			0.44 **	0.21		
Didn't think about ability to pay (=1)	-0.45 **	0.2	-0.47 **	0.19							-0.36 **	0.18
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)	-0.17 *	0.1	-0.19 *	0.11			-0.25 *	0.14			-0.18 *	0.11
Thought there would be side effects (=1)												
Socialisation			0.12 **	0.06								
Support from others	0.09 **	0.0					0.12 *	0.07	0.11 **	0.05	0.10 **	0.05
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)	0.12 *	0.1	0.13 *	0.07							0.12 *	0.07
Political parties, the police, law courts, and the Federal Government (=1)	0.20 ***	0.1	0.22 ***	0.07	0.17 **	0.09	0.28 ***	0.09	0.21 ***	0.06	0.25 ***	0.07
NGOs (=1)												
Government Ministries (=1)					0.11 *	0.07	0.15 **	0.07				
The Press (=1)												
Large companies (=1)			0.20 *	0.12	0.23 *	0.14			0.21 **	0.10	0.22 **	0.11
The Church (=1)												
Generalised trust (=1)												
Distance to historic centre (Km)					0.00 **	0.00	0.00 ***	0.00				
Distance to business centre (Km)	0.00 ***	0.00	0.00 ***	0.00					0.00 **	0.00		
Number of observations	468		439		272		256		481		451	

Table 64 – Ordered probit regression results, SWB3 – Happiness (positive affect)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.14	0.2	-0.08	0.21								
PM2.5 (log)					0.0	0.3	0.35	0.30				
O3 (log)									-0.39	0.29	-0.55 *	0.29
Age (years)			-0.03 *	0.02					-0.03 *	0.02	-0.03 **	0.02
Female (=1)	-0.24 **	0.1							-0.22 **	0.10		
Household income (1000 MXN)	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Married (=1)												
University education (=1)												
Unemployed (=1)	-0.81 ***	0.2	-0.77 ***	0.26					-0.77 ***	0.25	-0.74 ***	0.26
Very religious (=1)												
Smoker (=1)												
Own insurance (=1)												
No insurance (=1)												
Has children under 18 (=1)												
Heart disease (=1)							-1.62 ***	0.59				
Bronchitis (=1)	-0.38 *	0.2	-0.41 **	0.20	-0.48 **	0.21	-0.67 ***	0.24				
Asthma (=1)					0.93 ***	0.35	0.63 *	0.34				
Cancer (=1)	-0.38 **	0.1	-0.47 ***	0.16					-0.37 **	0.15	-0.46 ***	0.16
High blood pressure (=1)												
Hospital admission (=1)												
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)												
Health Ministry logo (=1)												
Blue Bank logo (=1)							0.34 *	0.18				
Red Bank logo (=1)	-0.41 **	0.2	-0.36 *	0.18					-0.31 *	0.17		
Spanish Bank logo (=1)	-0.50 ***	0.2	-0.62 ***	0.17					-0.46 ***	0.17	-0.54 ***	0.17
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)												
Doubted product would work (=1)									-0.19 *	0.11		
Risk doesn't apply to them (=1)	0.22 *	0.1	0.22 *	0.12					0.23 **	0.11	0.20 *	0.12
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)												
Thought there would be side effects (=1)												
Socialisation			0.24 ***	0.05	0.23 ***	0.07	0.25 ***	0.07				
Support from others					0.11 *	0.07						
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)	0.14 **	0.1	0.15 **	0.06					0.11 *	0.06	0.13 **	0.06
Political parties, the police, law courts, and the Federal Government (=1)	0.16 **	0.1	0.19 ***	0.07								
NGOs (=1)											-0.13 **	0.06
Government Ministries (=1)							0.14 **	0.07			0.14 **	0.06
The Press (=1)												
Large companies (=1)											0.23 **	0.11
The Church (=1)												
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)			0.00 *	0.00	0.00 **	0.00	0.00 **	0.00	0.00 **	0.00		
Number of observations	468		439		272		256		481		451	

Table 65 –Ordered probit regression results, SWB4 – Anxiety (negative affect) – reverse order scale (low values better)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.03	0.2	0.23	0.21								
PM2.5 (log)					0.9 ***	0.3	0.74 **	0.32				
O3 (log)									0.07	0.25	-0.10	0.25
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.0	0.00	0.00	0.00 **	0.00	0.00 *	0.00	0.00	0.00	0.00	0.00
Married (=1)												
University education (=1)												
Unemployed (=1)					-0.65 **	0.27	-0.70 **	0.28				
Very religious (=1)	-0.46 ***	0.1	-0.50 ***	0.13					-0.51 ***	0.13	-0.51 ***	0.13
Smoker (=1)												
Own insurance (=1)												
No insurance (=1)												
Has children under 18 (=1)												
Heart disease (=1)												
Bronchitis (=1)												
Asthma (=1)												
Cancer (=1)												
High blood pressure (=1)	0.47 ***	0.1	0.48 ***	0.15	0.38 **	0.18	0.41 **	0.19	0.48 ***	0.13	0.51 ***	0.15
Hospital admission (=1)												
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)	-0.23 *	0.1	-0.29 **	0.13					-0.22 *	0.12	-0.32 **	0.13
Health Ministry logo (=1)												
Red Bank logo (=1)												
Spanish Bank logo (=1)	0.39 **	0.2	0.38 **	0.17					0.31 *	0.16	0.31 *	0.17
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)												
Doubted product would work (=1)	0.37 ***	0.1	0.40 ***	0.11	0.56 ***	0.13	0.55 ***	0.14	0.38 ***	0.10	0.38 ***	0.11
Risk doesn't apply to them (=1)												
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)												
Thought there would be side effects (=1)												
Socialisation												
Support from others	-0.08 *	0.0	-0.10 **	0.05	-0.11 *	0.06	-0.14 **	0.07	-0.09 **	0.04	-0.12 ***	0.05
Civic engagement												
Volunteering (=1)					0.25 *	0.14						
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)	0.14 **	0.1							0.17 **	0.07	0.12 *	0.07
NGOs (=1)												
Government Ministries (=1)												
The Press (=1)												
Large companies (=1)									-0.19 *	0.10		
The Church (=1)												
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)			0.00 **	0.00							0.00 *	0.00
Number of observations	468		439		272		256		481		451	

Annex 6.4.5 – Ordered probit regression tables – Low social capital

Table 66 – Ordered probit regression results, SWB1 – Life satisfaction

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.20	0.3	-0.12	0.32								
PM2.5 (log)					-0.8 *	0.4	-0.59	0.44				
O3 (log)									-0.34	0.38	-0.24	0.37
Age (years)												
Female (=1)	-0.30 **	0.1	-0.35 **	0.15			-0.47 **	0.22	-0.25 *	0.15	-0.39 **	0.15
Household income (1000 MXN)	0.00 *	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00 *	0.00	0.00	0.00
Married (=1)	0.30 **	0.1	0.34 **	0.15					0.32 **	0.14	0.34 **	0.15
University education (=1)												
Unemployed (=1)	-1.43 ***	0.4	-1.38 ***	0.45	-1.68 ***	0.48	-1.17 **	0.49	-1.42 ***	0.39	-1.35 ***	0.44
Very religious (=1)												
Smoker (=1)												
Own insurance (=1)			0.46 *	0.24					0.38 *	0.22	0.53 **	0.24
No insurance (=1)												
Has children under 18 (=1)												
Heart disease (=1)												
Bronchitis (=1)	-0.58 **	0.3							-0.58 **	0.23		
Asthma (=1)												
Cancer (=1)			-0.50 *	0.26								
High blood pressure (=1)					-0.51 *	0.28						
Hospital admission (=1)												
Emergencies admission (=1)					0.92 **	0.42	1.21 ***	0.43				

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)					0.50 *	0.26						
Health Ministry logo (=1)												
Blue Bank logo (=1)	0.46 **	0.2	0.56 **	0.24	0.98 ***	0.33	0.71 **	0.29			0.43 *	0.23
Red Bank logo (=1)									-0.46 *	0.24		
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)												
Doubted product would work (=1)					-0.44 **	0.22	-0.52 **	0.24			-0.37 **	0.18
Risk doesn't apply to them (=1)									0.29 *	0.15	0.42 ***	0.16
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)	1.06 **	0.5	0.95 **	0.47								
Thought about other benefits (=1)												
Thought there would be side effects (=1)												
Socialisation	0.12 *	0.1	0.13 *	0.07	0.20 **	0.10	0.22 **	0.11	0.12 *	0.07	0.15 **	0.07
Support from others	0.12 **	0.1	0.11 *	0.06					0.13 **	0.06		
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)	-0.28 ***	0.1	-0.35 ***	0.11	-0.35 ***	0.11	-0.37 ***	0.12	-0.27 ***	0.10	-0.34 ***	0.10
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)	-0.16 **	0.1	-0.19 **	0.09	-0.21 **	0.10			-0.14 *	0.08	-0.18 **	0.08
Government Ministries (=1)			0.14 *	0.08							0.16 **	0.08
The Press (=1)												
Large companies (=1)												
The Church (=1)	0.47 ***	0.2	0.41 **	0.17	0.68 ***	0.23			0.40 ***	0.15	0.34 **	0.17
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)												
Number of observations	252		233		151		137		255		236	

Table 67 – Ordered probit regression results, SWB2 – Eudaimonia

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.03	0.3	-0.06	0.33								
PM2.5 (log)					0.3	0.5	0.03	0.44				
O3 (log)									-0.02	0.38	0.37	0.39
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Married (=1)	0.40 ***	0.1	0.41 ***	0.16					0.37 ***	0.14	0.40 **	0.16
University education (=1)												
Unemployed (=1)												
Very religious (=1)									0.30 *	0.18		
Smoker (=1)												
Own insurance (=1)	0.60 ***	0.2	0.58 **	0.24					0.59 ***	0.22	0.65 ***	0.23
No insurance (=1)												
Has children under 18 (=1)			0.35 **	0.15	0.34 *	0.18	0.69 ***	0.19			0.33 **	0.15
Heart disease (=1)												
Bronchitis (=1)												
Asthma (=1)			-0.68 *	0.37			-0.97 *	0.54			-0.68 *	0.36
Cancer (=1)			0.83 **	0.39							0.79 **	0.38
High blood pressure (=1)												
Hospital admission (=1)												
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
											0.29 *	0.17
Mexican university logo (=1)			0.00 **	0.00							0.00 **	0.00
Foreign university logo (=1)					-0.90 ***	0.27	0.50 **	0.23				
Environment Ministry logo (=1)			0.34 *	0.18								
Health Ministry logo (=1)												
Blue Bank logo (=1)	0.41 *	0.2			0.64 **	0.29	0.83 ***	0.31				
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completion (mins)												
Doubted product would work (=1)	-0.34 **	0.2	-0.54 ***	0.18	-0.69 ***	0.22	-0.73 ***	0.26	-0.36 **	0.18	-0.52 ***	0.18
Risk doesn't apply to them (=1)	0.45 ***	0.2	0.54 ***	0.16			0.59 **	0.24	0.38 **	0.16	0.51 ***	0.16
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)			0.63 **	0.26	0.53 **	0.26	0.69 **	0.30			0.63 **	0.26
Thought own risk of dying was higher (=1)							-1.34 **	0.52				
Thought about other benefits (=1)												
Thought there would be side effects (=1)												
Socialisation												
Support from others	0.12 *	0.1	0.15 **	0.07					0.11 *	0.06	0.15 **	0.06
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)					0.17 **	0.08						
NGOs (=1)									-0.19 **	0.09		
Government Ministries (=1)									0.13 *	0.08		
The Press (=1)												
Large companies (=1)												
The Church (=1)	0.26 *	0.1							0.39 **	0.18		
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)												
Number of observations	252		233		151		137		255		236	

Table 68 – Ordered probit regression results, SWB3 – Happiness (positive affect)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.27	0.3	-0.34	0.29								
PM2.5 (log)					-1.0 **	0.4	-1.01 **	0.41				
O3 (log)									-0.69 *	0.39	-0.62 *	0.37
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.0	0.00	0.00	0.00	0.00	0.00 *	0.00	0.00	0.00	0.00	0.00
Married (=1)											0.27 *	0.15
University education (=1)												
Unemployed (=1)	-1.47 ***	0.4	-1.27 ***	0.39	-1.41 ***	0.43	-0.86 **	0.39	-1.43 ***	0.34	-1.14 ***	0.38
Very religious (=1)												
Smoker (=1)												
Own insurance (=1)					0.71 **	0.28						
No insurance (=1)							-0.52 **	0.23				
Has children under 18 (=1)												
Heart disease (=1)												
Bronchitis (=1)												
Asthma (=1)												
Cancer (=1)	0.97 ***	0.3	0.78 **	0.31					0.78 ***	0.30	0.70 **	0.31
High blood pressure (=1)	-0.45 **	0.2							-0.42 **	0.19		
Hospital admission (=1)												
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)	0.43 **	0.2	0.35 *	0.19					0.34 *	0.19		
Environment Ministry logo (=1)												
Health Ministry logo (=1)	0.39 *	0.2										
Blue Bank logo (=1)	0.67 ***	0.2	0.44 *	0.23	0.89 ***	0.30			0.57 ***	0.20	0.44 **	0.22
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)					-0.01 **	0.00	-0.01 **	0.00				
Doubted product would work (=1)	-0.29 *	0.2			-0.61 ***	0.21	-0.48 **	0.24	-0.29 *	0.16	-0.30 *	0.16
Risk doesn't apply to them (=1)	0.35 **	0.2	0.37 **	0.17	0.42 **	0.20	0.50 **	0.22	0.42 ***	0.16	0.51 ***	0.16
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)	1.01 **	0.5	0.94 **	0.48								
Thought about other benefits (=1)												
Thought there would be side effects (=1)												
Socialisation	0.13 **	0.1	0.17 **	0.07					0.14 **	0.07	0.14 **	0.07
Support from others												
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)	-0.29 ***	0.1	-0.24 **	0.10	-0.20 *	0.11			-0.27 ***	0.09	-0.19 *	0.10
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)												
Government Ministries (=1)												
The Press (=1)												
Large companies (=1)												
The Church (=1)	0.30 **	0.1	0.30 **	0.15					0.28 *	0.15		
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)												
Number of observations	252		233		151		137		255		236	

Table 69 –Ordered probit regression results, SWB4 – Anxiety (negative affect) – reverse order scale (low values better)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.52 *	0.3	-0.59 *	0.31								
PM2.5 (log)					0.3	0.4	-0.41	0.53				
O3 (log)									-0.64	0.44	-0.42	0.47
Age (years)												
Female (=1)							-0.39 **	0.20				
Household income (1000 MXN)	0.00 **	0.0	0.00 ***	0.00	0.00 ***	0.00	0.00 ***	0.00	0.00 ***	0.00	0.00 ***	0.00
Married (=1)												
University education (=1)							-0.53 **	0.22				
Unemployed (=1)												
Very religious (=1)	-0.38 **	0.2										
Smoker (=1)					0.50 **	0.19						
Own insurance (=1)							0.52 **	0.22				
No insurance (=1)												
Has children under 18 (=1)												
Heart disease (=1)							-1.02 *	0.56				
Bronchitis (=1)												
Asthma (=1)					0.98 **	0.50						
Cancer (=1)	0.96 **	0.4	1.00 **	0.41					0.92 **	0.39	1.03 ***	0.40
High blood pressure (=1)							1.20 ***	0.34				
Hospital admission (=1)												
Emergencies admission (=1)							0.88 *	0.46				

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)												
Health Ministry logo (=1)					0.59 **	0.30						
Red Bank logo (=1)	0.45 *	0.2							0.38 *	0.21	0.50 **	0.23
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)	-0.58 ***	0.1	-0.53 ***	0.15	-0.52 ***	0.17			-0.61 ***	0.15	-0.53 ***	0.15
Time to completion (mins)	0.00 ***	0.0	0.00 **	0.00					0.00 ***	0.00	0.00 ***	0.00
Doubted product would work (=1)												
Risk doesn't apply to them (=1)												
Didn't understand payment timing (=1)	0.33 **	0.2	0.35 *	0.18	0.55 **	0.24						
Didn't think about ability to pay (=1)			-0.44 *	0.23							-0.44 **	0.22
Thought own risk of dying was higher (=1)	0.75 **	0.4	1.01 ***	0.38			1.01 **	0.45			0.85 **	0.37
Thought about other benefits (=1)	-0.30 **	0.1	-0.27 *	0.15	-0.35 *	0.18	-0.54 **	0.21	-0.26 *	0.14	-0.31 **	0.15
Thought there would be side effects (=1)												
Socialisation												
Support from others	-0.13 **	0.1							-0.13 **	0.06		
Civic engagement					0.24 **	0.12			0.14 *	0.08		
Volunteering (=1)												
Trust in institutions												
Universities (=1)	0.19 **	0.1	0.16 *	0.09								
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)												
Government Ministries (=1)												
The Press (=1)	-0.31 *	0.2	-0.38 **	0.17					-0.27 *	0.16	-0.34 **	0.16
Large companies (=1)												
The Church (=1)			0.30 *	0.15					0.28 **	0.14	0.33 **	0.15
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)												
Number of observations	252		233		151		137		255		236	

Annex 6.4.6 – Ordered probit regression tables – Traditionalists (social capital type)

Table 70 – Ordered probit regression results, SWB1 – Life satisfaction

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	0.01	0.2	0.03	0.18								
PM2.5 (log)					0.1	0.3	0.06	0.30				
O3 (log)									0.23	0.22	0.13	0.23
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Married (=1)	0.35 ***	0.1	0.32 ***	0.10					0.32 ***	0.10		
University education (=1)												
Unemployed (=1)	-0.64 ***	0.2	-0.60 ***	0.21	-0.49 **	0.25	-0.59 **	0.24	-0.67 ***	0.20		
Very religious (=1)					0.26 *	0.15						
Smoker (=1)											0.29 ***	0.10
Own insurance (=1)	0.34 **	0.1	0.31 **	0.14					0.33 **	0.13		
No insurance (=1)											-0.61 ***	0.21
Has children under 18 (=1)												
Heart disease (=1)	-0.81 **	0.3	-1.04 ***	0.34	-0.77 *	0.43	-0.99 **	0.48	-0.74 **	0.30	0.27 **	0.14
Bronchitis (=1)							-0.63 ***	0.19				
Asthma (=1)	-0.69 ***	0.2	-0.64 ***	0.22	-0.81 ***	0.31	0.46 *	0.25	-0.65 ***	0.21		
Cancer (=1)												
High blood pressure (=1)											-0.96 ***	0.33
Hospital admission (=1)							0.48 **	0.21				
Emergencies admission (=1)	0.42 *	0.2	0.54 **	0.25					0.38 *	0.22	-0.62 ***	0.21

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)					-0.29 *	0.16			-0.29 **	0.13	0.47 *	0.24
Health Ministry logo (=1)												
Blue Bank logo (=1)					-0.32 *	0.17	-0.30 *	0.18				
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)												
Doubted product would work (=1)												
Risk doesn't apply to them (=1)	0.43 ***	0.1	0.43 ***	0.11	0.43 ***	0.13	0.44 ***	0.13	0.44 ***	0.10		
Didn't understand payment timing (=1)	-0.29 *	0.2	-0.30 *	0.15					-0.28 *	0.15		
Didn't think about ability to pay (=1)									0.25 *	0.15		
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)	-0.22 **	0.1			-0.25 **	0.12	-0.27 **	0.13	-0.20 **	0.10	0.43 ***	0.11
Thought there would be side effects (=1)												
Socialisation					0.17 ***	0.06	0.17 ***	0.06				
Support from others					0.12 **	0.05						
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)	0.14 **	0.1	0.15 **	0.07	0.16 **	0.07	0.21 ***	0.07			0.14 **	0.07
NGOs (=1)												
Government Ministries (=1)	-0.13 **	0.1										
The Press (=1)												
Large companies (=1)			-0.25 **	0.11			-0.23 *	0.13	-0.23 **	0.11	-0.28 **	0.11
The Church (=1)												
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)							0.00 ***	0.00			0.00 ***	0.00
Number of observations	510		468		331		301		522		477	

Table 71 – Ordered probit regression results, SWB2 – Eudaimonia

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	0.16	0.2	0.16	0.18								
PM2.5 (log)					-0.1	0.3	0.26	0.34				
O3 (log)									0.11	0.21	0.12	0.23
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.0	0.00	0.00	0.00 **	0.00	0.00	0.00	0.00 *	0.00	0.00 *	0.00
Married (=1)	0.27 ***	0.1	0.29 ***	0.10	0.25 **	0.12	0.22 *	0.12	0.30 ***	0.10	0.27 ***	0.10
University education (=1)												
Unemployed (=1)	-0.59 ***	0.2	-0.61 ***	0.23			-0.52 *	0.28	-0.58 ***	0.21	-0.64 ***	0.23
Very religious (=1)					0.31 *	0.17	0.32 *	0.17				
Smoker (=1)												
Own insurance (=1)	0.23 *	0.1										
No insurance (=1)												
Has children under 18 (=1)												
Heart disease (=1)												
Bronchitis (=1)												
Asthma (=1)	-0.78 ***	0.2	-0.74 ***	0.18	-1.14 ***	0.28	-1.01 ***	0.25	-0.93 ***	0.19	-0.80 ***	0.18
Cancer (=1)												
High blood pressure (=1)												
Hospital admission (=1)												
Emergencies admission (=1)					0.64 **	0.27						

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)	0.35 ***	0.1	0.32 ***	0.10	0.40 ***	0.13	0.34 **	0.14	0.36 ***	0.10	0.31 ***	0.10
Foreign university logo (=1)											-0.18 *	0.10
Environment Ministry logo (=1)	-0.24 *	0.1			-0.36 **	0.16	-0.42 ***	0.16	-0.27 *	0.14	-0.24 *	0.14
Health Ministry logo (=1)												
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completion (mins)									0.00 **	0.00		
Doubted product would work (=1)												
Risk doesn't apply to them (=1)												
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)					-0.25 **	0.12	-0.31 **	0.13	-0.21 **	0.10		
Thought there would be side effects (=1)												
Socialisation	0.20 ***	0.1	0.19 ***	0.05	0.19 ***	0.06	0.23 ***	0.06			0.20 ***	0.05
Support from others	0.10 **	0.0	0.11 **	0.04	0.11 **	0.05					0.10 **	0.04
Civic engagement	-0.20 **	0.1	-0.23 ***	0.08					-0.19 **	0.08	-0.23 ***	0.08
Volunteering (=1)												
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)												
Government Ministries (=1)	-0.12 **	0.1	-0.12 **	0.06							-0.12 **	0.06
The Press (=1)	0.24 *	0.1	0.27 **	0.13					0.24 *	0.13	0.27 **	0.13
Large companies (=1)												
The Church (=1)												
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)												
Number of observations	510		468		331		301		522		477	

Table 72 – Ordered probit regression results, SWB3 – Happiness (positive affect)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	0.59 **	0.2	0.16	0.18								
PM2.5 (log)					-0.2	0.3	0.34	0.30				
O3 (log)									0.06	0.21	0.10	0.23
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00 *	0.0	0.00 *	0.00	0.00 **	0.00	0.00 *	0.00	0.00 *	0.00	0.00	0.00
Married (=1)	0.26 ***	0.1	0.30 ***	0.10					0.24 **	0.09	0.29 ***	0.10
University education (=1)												
Unemployed (=1)	-0.58 ***	0.2	-0.54 ***	0.21					-0.58 ***	0.20	-0.53 **	0.21
Very religious (=1)												
Smoker (=1)												
Own insurance (=1)												
No insurance (=1)												
Has children under 18 (=1)												
Heart disease (=1)	-0.63 *	0.3							-0.59 *	0.35		
Bronchitis (=1)												
Asthma (=1)	-0.47 *	0.2	-0.49 **	0.21					-0.48 **	0.23	-0.49 **	0.21
Cancer (=1)												
High blood pressure (=1)												
Hospital admission (=1)												
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)							0.37 *	0.21				
Environment Ministry logo (=1)												
Health Ministry logo (=1)												
Red Bank logo (=1)												
Spanish Bank logo (=1)							0.39 **	0.20				
Time on WTP5, over 25 secs (=1)												
Time to completion (mins)												
Doubted product would work (=1)												
Risk doesn't apply to them (=1)	0.30 ***	0.1	0.33 ***	0.11	0.38 ***	0.13	0.40 ***	0.14	0.35 ***	0.10	0.35 ***	0.11
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)	-0.31 **	0.1							-0.25 *	0.15		
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)					-0.20 *	0.12	-0.21 *	0.13	-0.18 *	0.10		
Thought there would be side effects (=1)												
Socialisation			0.14 ***	0.05	0.12 *	0.06					0.14 ***	0.05
Support from others			0.11 **	0.05	0.11 **	0.05	0.14 ***	0.05	0.08 **	0.04	0.11 **	0.04
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)	0.13 **	0.1			0.20 ***	0.07	0.25 ***	0.08	0.11 *	0.06		
NGOs (=1)	-0.08 *	0.0	-0.09 *	0.05					-0.10 **	0.05	-0.09 *	0.05
Government Ministries (=1)												
The Press (=1)												
Large companies (=1)							-0.25 *	0.14				
The Church (=1)												
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)												
Number of observations	510		468		331		301		522		477	

Table 73 –Ordered probit regression results, SWB4 – Anxiety (negative affect) – reverse order scale (low values better)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.16	0.2	0.02	0.19								
PM2.5 (log)					0.2	0.3	0.17	0.29				
O3 (log)									-0.25	0.22	-0.05	0.21
Age (years)												
Female (=1)												
Household income (1000 MXN)	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Married (=1)												
University education (=1)												
Unemployed (=1)												
Very religious (=1)												
Smoker (=1)												
Own insurance (=1)	-0.34 **	0.1	-0.23 *	0.13	-0.48 ***	0.16	-0.45 ***	0.16	-0.29 **	0.13	-0.26 **	0.13
No insurance (=1)	-0.26 **	0.1							-0.21 *	0.11	0.17 **	0.08
Has children under 18 (=1)												
Heart disease (=1)												
Bronchitis (=1)												
Asthma (=1)	0.69 ***	0.2	0.81 ***	0.21					0.67 ***	0.24	0.73 ***	0.23
Cancer (=1)												
High blood pressure (=1)												
Hospital admission (=1)			-0.50 **	0.24							-0.44 *	0.24
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)												
Health Ministry logo (=1)												
Red Bank logo (=1)					-0.30 *	0.18	-0.33 *	0.18				
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)	-0.22 **	0.1							-0.24 **	0.11	-0.21 *	0.11
Time to completion (mins)	0.00 *	0.0			0.00 **	0.00	0.00 ***	0.00	0.00 *	0.00	0.00 *	0.00
Doubted product would work (=1)												
Risk doesn't apply to them (=1)	-0.23 **	0.1	-0.27 **	0.11					-0.24 **	0.10	-0.26 **	0.11
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)												
Thought about other benefits (=1)												
Thought there would be side effects (=1)	-0.20 *	0.1										
Socialisation												
Support from others												
Civic engagement												
Volunteering (=1)	0.20 **	0.1	0.15 *	0.08					0.19 **	0.08		
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)	-0.11 **	0.0	-0.11 **	0.05					-0.10 **	0.05	-0.09 *	0.05
Government Ministries (=1)	0.16 ***	0.1	0.14 **	0.06	0.14 **	0.06			0.14 ***	0.05	0.14 **	0.06
The Press (=1)												
Large companies (=1)												
The Church (=1)												
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)												
Number of observations	510		468		331		301		522		477	

Annex 6.4.7 – Ordered probit regression tables – Miniaturisation of society (social capital type)

Table 74 – Ordered probit regression results, SWB1 – Life satisfaction

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.65 ***	0.2	-0.63 **	0.27								
PM2.5 (log)					0.7 *	0.4	1.17 **	0.48				
O3 (log)									-0.64 **	0.28	-0.57 *	0.32
Age (years)												
Female (=1)	0.30 **	0.1	0.25 *	0.14	0.46 ***	0.17	0.50 ***	0.19	0.30 **	0.13	0.28 **	0.14
Household income (1000 MXN)	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Married (=1)	0.28 **	0.1	0.27 *	0.14					0.28 **	0.13		
University education (=1)	0.29 **	0.1			0.62 ***	0.20	0.51 **	0.21	0.29 **	0.14		
Unemployed (=1)	-0.59 *	0.3										
Very religious (=1)							-0.66 **	0.30				
Smoker (=1)												
Own insurance (=1)												
No insurance (=1)												
Has children under 18 (=1)					0.35 **	0.16						
Heart disease (=1)					-0.69 *	0.37	-0.88 ***	0.28				
Bronchitis (=1)												
Asthma (=1)												
Cancer (=1)												
High blood pressure (=1)									-0.36 ***	0.13		
Hospital admission (=1)												
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)					-0.38 *	0.20	-0.49 **	0.22				
Foreign university logo (=1)	-0.48 **	0.2	-0.44 **	0.21	-0.73 **	0.33			-0.44 **	0.20	-0.42 **	0.21
Environment Ministry logo (=1)												
Health Ministry logo (=1)												
Red Bank logo (=1)							0.64 **	0.26				
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)												
Doubted product would work (=1)												
Risk doesn't apply to them (=1)												
Didn't understand payment timing (=1)							0.64 **	0.27				
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)	0.83 ***	0.3	0.87 ***	0.30	2.90 ***	0.70	1.58 *	0.95	0.80 ***	0.23	0.73 ***	0.26
Thought about other benefits (=1)												
Thought there would be side effects (=1)					-0.39 **	0.18	-0.71 ***	0.20				
Socialisation												
Support from others											0.12 *	0.07
Civic engagement							0.16 **	0.08				
Volunteering (=1)												
Trust in institutions												
Universities (=1)					0.26 **	0.12	0.28 **	0.14				
Political parties, the police, law courts, and the Federal Government (=1)	0.12 *	0.1										
NGOs (=1)												
Government Ministries (=1)	0.15 **	0.1	0.13 *	0.07					0.19 ***	0.07	0.16 **	0.08
The Press (=1)	-0.40 **	0.2							-0.35 **	0.15	-0.28 *	0.16
Large companies (=1)									0.18 *	0.10		
The Church (=1)							-0.49 **	0.22				
Generalised trust (=1)												
Distance to historic centre (Km)							0.00 ***	0.00				
Distance to business centre (Km)												
Number of observations	291		256		179		161		299		264	

Table 75 – Ordered probit regression results, SWB2 – Eudaimonia

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	0.22	0.4	-0.17	0.36								
PM2.5 (log)					1.3 ***	0.4	0.68	0.42				
O3 (log)									-0.49 *	0.29	-0.06	0.43
Age (years)					0.06 **	0.03	0.06 **	0.03				
Female (=1)	0.58 ***	0.1	0.60 ***	0.15	0.86 ***	0.20	0.95 ***	0.23	0.59 ***	0.14	0.54 ***	0.15
Household income (1000 MXN)	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Married (=1)												
University education (=1)												
Unemployed (=1)					-0.56 *	0.29	-0.74 **	0.30				
Very religious (=1)												
Smoker (=1)	-0.36 **	0.2	-0.30 *	0.18			-0.38 *	0.20	-0.28 *	0.16	-0.30 *	0.17
Own insurance (=1)												
No insurance (=1)												
Has children under 18 (=1)					0.30 *	0.18	0.36 *	0.19				
Heart disease (=1)												
Bronchitis (=1)												
Asthma (=1)												
Cancer (=1)												
High blood pressure (=1)												
Hospital admission (=1)			-0.59 **	0.28	-1.03 **	0.44	-1.16 **	0.57				
Emergencies admission (=1)			0.60 *	0.33	1.13 ***	0.33	1.17 **	0.51				

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)			-0.78 ***	0.27	-1.00 ***	0.29	-0.87 ***	0.29	-0.71 ***	0.25	-0.70 ***	0.26
Foreign university logo (=1)	-1.25 ***	0.3			-1.17 ***	0.34			-1.16 ***	0.25	-1.32 ***	0.27
Environment Ministry logo (=1)	-1.01 ***	0.2	-0.97 ***	0.28	-0.67 *	0.36			-1.03 ***	0.26	-0.93 ***	0.27
Health Ministry logo (=1)	-0.98 ***	0.3	-0.99 ***	0.27	-0.94 ***	0.33	-1.04 ***	0.38	-0.99 ***	0.23		
Blue Bank logo (=1)	-0.81 ***	0.2	-0.68 ***	0.25			-0.56 *	0.30	-0.79 ***	0.24	-0.70 ***	0.24
Red Bank logo (=1)												
Spanish Bank logo (=1)	-0.91 ***	0.2	-0.97 ***	0.26	-0.78 **	0.33	-0.75 **	0.32	-0.87 ***	0.23	-0.89 ***	0.25
Time on WTP5, over 25 secs (=1)												
Time to completion (mins)			-0.01 **	0.00							-0.01 *	0.00
Doubted product would work (=1)	0.35 **	0.2							0.35 **	0.15	0.28 *	0.16
Risk doesn't apply to them (=1)												
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)												
Thought own risk of dying was higher (=1)					1.31 *	0.67	1.27 **	0.51				
Thought about other benefits (=1)												
Thought there would be side effects (=1)												
Socialisation												
Support from others												
Civic engagement	0.20 ***	0.1	0.21 ***	0.07	0.23 ***	0.08	0.33 ***	0.08	0.20 ***	0.06	0.22 ***	0.07
Volunteering (=1)												
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)			0.15 *	0.09					0.16 **	0.08		
NGOs (=1)												
Government Ministries (=1)									0.19 **	0.07	0.19 **	0.08
The Press (=1)	-0.44 ***	0.2	-0.45 **	0.18					-0.44 ***	0.16	-0.35 **	0.17
Large companies (=1)												
The Church (=1)					-0.49 **	0.20	-0.51 **	0.21				
Generalised trust (=1)												
Distance to historic centre (Km)	0.00 *	0.00										
Distance to business centre (Km)												
Number of observations	291		256		179		161		299		264	

Table 76 – Ordered probit regression results, SWB3 – Happiness (positive affect)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	-0.38	0.2	-1.11 ***	0.30								
PM2.5 (log)					-0.1	0.4	0.83 **	0.41				
O3 (log)									-0.05	0.32	-0.19	0.34
Age (years)												
Female (=1)					0.35 *	0.18	0.37 *	0.19				
Household income (1000 MXN)	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Married (=1)												
University education (=1)												
Unemployed (=1)					-0.59 *	0.30			-0.57 *	0.34		
Very religious (=1)							-1.00 ***	0.26				
Smoker (=1)	-0.36 **	0.2	-0.37 **	0.17					-0.37 **	0.15	-0.37 **	0.16
Own insurance (=1)												
No insurance (=1)												
Has children under 18 (=1)					0.43 **	0.17						
Heart disease (=1)									0.76 **	0.37		
Bronchitis (=1)	0.56 *	0.3	0.53 *	0.28								
Asthma (=1)			-0.65 *	0.39								
Cancer (=1)												
High blood pressure (=1)												
Hospital admission (=1)												
Emergencies admission (=1)					0.45 *	0.26						

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)	-0.42 **	0.2					-0.46 *	0.25				
Health Ministry logo (=1)	-0.34 *	0.2										
Red Bank logo (=1)												
Spanish Bank logo (=1)												
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)												
Doubted product would work (=1)												
Risk doesn't apply to them (=1)												
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)							0.59 *	0.32				
Thought own risk of dying was higher (=1)	0.97 ***	0.4	1.45 ***	0.42	2.02 ***	0.69			0.88 **	0.37	1.05 *	0.63
Thought about other benefits (=1)	-0.28 **	0.1										
Thought there would be side effects (=1)					-0.35 *	0.19	-0.58 ***	0.20				
Socialisation												
Support from others			0.16 **	0.07	0.33 ***	0.08	0.54 ***	0.10				
Civic engagement							0.19 **	0.09				
Volunteering (=1)												
Trust in institutions												
Universities (=1)					0.25 *	0.14	0.28 *	0.15				
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)												
Government Ministries (=1)	0.16 **	0.1					-0.21 *	0.11	0.15 **	0.07	0.16 **	0.07
The Press (=1)	-0.43 **	0.2	-0.40 **	0.16					-0.40 ***	0.16	-0.29 **	0.15
Large companies (=1)	0.24 *	0.1	0.32 **	0.15								
The Church (=1)							-0.47 **	0.20				
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)												
Number of observations	291		256		179		161		299		264	

Table 77 –Ordered probit regression results, SWB4 – Anxiety (negative affect) – reverse order scale (low values better)

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
PM10 (log)	0.27	0.3	0.08	0.27								
PM2.5 (log)					0.1	0.3	0.03	0.34				
O3 (log)									-0.63 *	0.35	-0.55	0.38
Age (years)												
Female (=1)					-0.31 *	0.17						
Household income (1000 MXN)	0.00 **	0.0	0.00 **	0.00	0.00	0.00	0.00	0.00	0.00 *	0.00	0.00	0.00
Married (=1)												
University education (=1)												
Unemployed (=1)												
Very religious (=1)												
Smoker (=1)	0.26 *	0.1					0.38 **	0.18				
Own insurance (=1)			0.31 **	0.15								
No insurance (=1)							-0.54 *	0.31				
Has children under 18 (=1)												
Heart disease (=1)												
Bronchitis (=1)					-0.58 *	0.33	-0.71 **	0.32				
Asthma (=1)	0.87 ***	0.3	1.08 ***	0.22	0.77 ***	0.27	1.22 ***	0.25	0.87 ***	0.24	1.03 ***	0.21
Cancer (=1)												
High blood pressure (=1)												
Hospital admission (=1)			0.46 *	0.24	0.69 **	0.28	0.75 **	0.30			0.45 *	0.24
Emergencies admission (=1)												

	PM10				PM2.5				O3			
	Sample A		Sample C		Sample A		Sample C		Sample A		Sample C	
	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.	coefficient	s.e.
Mexican university logo (=1)												
Foreign university logo (=1)												
Environment Ministry logo (=1)	0.43 **	0.2	0.94 ***	0.29					0.39 *	0.20	0.98 ***	0.29
Health Ministry logo (=1)			0.61 **	0.27							0.64 **	0.27
Blue Bank logo (=1)			0.49 **	0.24							0.52 **	0.25
Red Bank logo (=1)			0.67 **	0.29							0.67 **	0.29
Spanish Bank logo (=1)			0.63 ***	0.24							0.62 ***	0.24
Time on WTP5, over 25 secs (=1)												
Time to completition (mins)	0.00 ***	0.0			0.00 ***	0.00			0.00 ***	0.00		
Doubted product would work (=1)	0.30 **	0.1			0.47 **	0.20			0.24 *	0.13		
Risk doesn't apply to them (=1)							-0.51 ***	0.19				
Didn't understand payment timing (=1)												
Didn't think about ability to pay (=1)									0.34 *	0.21		
Thought own risk of dying was higher (=1)			-0.97 **	0.49	-5.57 ***	0.23	-4.63 ***	0.37			-0.91 **	0.45
Thought about other benefits (=1)												
Thought there would be side effects (=1)												
Socialisation												
Support from others					-0.17 **	0.08						
Civic engagement												
Volunteering (=1)												
Trust in institutions												
Universities (=1)												
Political parties, the police, law courts, and the Federal Government (=1)												
NGOs (=1)	0.16 **	0.1										
Government Ministries (=1)					0.22 **	0.09						
The Press (=1)					-0.42 **	0.19						
Large companies (=1)												
The Church (=1)					0.43 **	0.17						
Generalised trust (=1)												
Distance to historic centre (Km)												
Distance to business centre (Km)					0.00 *	0.00	0.00 *	0.00				
Number of observations	291		256		179		161		299		264	

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